

RECORDS
OF
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VOL. LXI, PART 3.
1928.

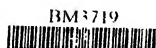
CONTENTS.

	PAGES.
The Mineral Production of India during 1927. By L. L. Fermor, O.B.E., A.R.S.M., D.Sc., F.G.S., M.Inst. M.M., Officiating Director, Geological Survey of India	207-293
Note on Coking Tests made with Condwana Coals. By Cyril S. Fox, D.Sc., M.I.Min.E., F.G.S., Officiating Superintendent, Geological Survey of India	294-314
A Zinc-Spinel, from Southern India. By W. A. K. Christie, B.Sc., Ph.D., M.Inst.M.M., Chemist, Geological Survey of India, and A. L. Coulson, M.Sc., D.I.C., F.G.S., As- sistant Superintendent, Geological Survey of India	315-317
A New Indian Meteorite: The Lua Fall. By A. L. Coulson, M.Sc. (Melb.), D.I.C. (Lond.), F.G.S., Assistant Superin- tendent, Geological Survey of India. (With Plates 21 to 25)	318-324
Miscellaneous Note: Löllingite from the Hazaribagh District (A. L. Coulson)	325

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Part 2 (out of print).—Geology of parts of Bellary and Anantapur districts. Geology of upper Dehing basin in Singpho Hills. Microscopic characters of eruptive rocks from Central Himalayas. Mammalia of Karnul Caves. Prospects of finding coal in Western Rajputana. Olive group of Salt-range. Boulder-beds of Salt-range. Gondwana Homotaxis.

Part 3 (out of print).—Geological sketch of Vizagapatam district, Madras. Geology of Northern Jerusalem. Microscopic structure of Malani rocks of Arvali region. Malanjkhadi copper-ore in Balaghat district, C. P.

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- Part 2.*—Fossil vertebrata of India. Echinoides of cretaceous series of Lower Narbada Valley. Field-notes: No. 5—to accompany geological sketch map of Afghanistan and North-Eastern Khorassan. Microscopic structure of Rajmahal and Deccan traps. Dolerite of Chor. Identity of Olive series in east with speckled sandstone in west of Salt-range in Punjab.
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- Part 3 (out of print).*—Coal outcrops in Sharigh Valley, Baluchistan. Trilobites in Neobolus beds of Salt-range. Geological notes. Cherri Poonjee coal-field, in Khasia Hills. Carboniferous Matt from Nepal. President of Geological Society of London on International Geological Congress of 1888. Tin-mining in Mergui district.
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RECORDS

OF

THE GEOLOGICAL SURVEY OF INDIA.

Part 3.]

1928

[September

THE MINERAL PRODUCTION OF INDIA DURING 1927.
 BY L. L. FERMOR, O.B.E., A.R.S.M., D.SC.,
 F.G.S., M. INST. M.M., *Officiating Director, Geological
 Survey of India.*

CONTENTS.

	PAGE.
I.—INTRODUCTION—	
Total value of production. Number of mineral concessions granted	207
II.—MINERALS OF GROUP I—	
Antimony; Chromite; Coal; Copper; Diamonds; Gold; Iron; Jadeite; Lead; Magnesite; Manganese; Mica; Monazite; Nickel; Petroleum; Ruby, Sapphire and Spinel; Salt; Saltpetre; Silver; Tin; Tungsten; Zinc . . .	210
III.—MINERALS OF GROUP II—	
Alum; Amber; Apatite; Asbestos; Barytes; Bauxite; Beryl; Bismuth; Borax; Building Materials; Clays; Copperas; Corundum; Fuller's Earth; Gypsum; Ilmenite; Kyanite; Ochre; Refractory Materials; Serpen- tine; Soda; Steatite; Zircon	244
IV.—MINERAL CONCESSIONS GRANTED DURING THE YEAR . . .	253

I.—INTRODUCTION.

THE method of classification adopted in the first Review of Mineral Production published in these Records (Vol. XXXII, 1905), although admittedly not entirely satisfactory, is still the best that can be devised under present conditions. As the methods of

collecting the returns become more precise and the machinery employed for the purpose more efficient, the number of minerals included in Class I—for which approximately trustworthy annual returns are available—increases, and it is hoped that the minerals of Class II—for which regularly recurring and full particulars cannot be procured—will in time be reduced to a very small number. In the case of minerals still exploited chiefly by primitive Indian methods, and thus forming the basis of an industry carried on by a large number of persons, each working independently and on a very small scale, the collection of reliable statistics is impossible; the total error from year to year is, however, not improbably approximately constant and the figures obtained may be accepted as a fairly reliable index to the general trend of the industry. In the case of gold, the small indigenous alluvial industry contributes such an insignificant portion to the total outturn that any error from this source may be regarded as negligible.

The average value of the Indian rupee during the year 1927 was 1s. $5\frac{2}{3}\frac{9}{2}d.$; the highest value reached was 1s. $6\frac{3}{4}\frac{3}{2}d.$, and the lowest 1s. $5\frac{1}{2}\frac{3}{4}d.$ The values shown in Table 1 and all following tables of the present Review are given on the basis of 1s. $5\frac{1}{2}\frac{5}{16}d.$ to the rupee for 1926 and 1s. $5\frac{2}{3}\frac{9}{2}d.$ to the rupee for 1927, the latter ratio being taken for ease of calculation as equivalent to Rs. 13·4 to £1, instead of Rs. 13·403.

From Table 1 it will be seen that there has been a decrease of over £2,899,000 or about 11·2 per cent. in the value of the total production over that of 1926. An increase or decrease in value does not always correspond to a similar variation in output, and cannot, therefore, be regarded as an infallible indication of the state of an industry. It must be understood that the figures of Table 1 are value figures and that a decrease does not necessarily mean a reduced output or a decline in the industry. For instance, in the cases of coal, lead, and silver, production increased substantially and the reduced value figures are due to a drop in the market price. Practically the whole of the decrease is, however, due to an enormous fall in the value of the petroleum output, the quantity of which increased slightly.

The number of mineral concessions granted during the year amounted to 714 against 758 in the preceding year; of these two were exploring licenses, 603 were prospecting licenses and 109 were mining leases.

TABLE 1.—*Total Value of Minerals for which returns of production are available for the years 1926 and 1927.*

	1926. (£1= Rs. 13'4.)	1927. (£1= Rs. 13'4.)	Increase.	Decrease.	Variation per cent.
	£	£	£	£	
Coal	7,574,599	7,079,852	..	494,747	—6'4
Petroleum	7,305,509	4,421,468	..	2,884,041	—39'5
Manganese-ore (a)	2,590,357	2,844,237	253,880	..	+9'5
Lead and lead-ore	1,666,587	1,641,095	..	25,492	—1'5
Gold	(c) 1,624,238	1,626,913	2,675	..	+0'2
Building materials	860,558	914,187	53,629	..	+6'2
Salt	836,830	849,265	12,435	..	+1'5
Silver	663,063	708,846	45,783	..	+6'9
Mica (b)	820,901	691,341	..	129,560	—15'8
Zinc-ore (b)	321,177	522,737	201,560	..	+62'8
Tin and tin-ore	455,362	493,864	38,502	..	+8'4
Iron-ore	349,676	380,735	31,059	..	+8'8
Copper-ore and matte	362,566	344,299	..	18,267	—5'0
Saltpetre (b)	98,846	113,632	14,786	..	+14'9
Chromite	30,810	65,743	34,933	..	+113'4
Tungsten-ore	57,535	42,537	..	14,998	—26'1
Ilmenite	7,587	33,443	25,856	..	+340'8
Jadeite (b)	35,091	22,570	..	12,521	—35'6
Ruby, sapphire and spinel.	34,834	20,883	..	13,951	—40'0
Clays	32,807	19,819	..	12,988	—39'6
Magnesite	26,444	17,115	..	9,329	—35'3
Nickel speiss . . . . .	..	10,073	10,073	..	..
Antimonial lead	23,918	9,930	..	13,988	—58'5
Zircon	2,987	8,129	5,142	..	+172'1
Stearite	11,213	7,816	..	3,397	—30'3
Gypsum	(c) 5,929	6,702	773	..	+13'0
Monazite	947	3,810	2,863	..	+302'3
Diamonds	2,131	3,354	1,223	..	+57'4
Bauxite	2,744	2,107	..	637	—23'2
Ochre	(c) 2,252	2,051	..	201	—8'9
Amber	1,599	2,028	429	..	+26'8
Refractory materials	1,624	2,025	401	..	+24'7
Alum	3,761	1,728	..	2,033	—54'5
Fuller's earth	1,761	1,687	..	74	—4'2
Asbestos	786	1,011	225	..	+28'7
Antimony-ore	201	784	583	..	+290'0
Apatite	804	750	..	54	—6'7
Barytes	690	738	48	..	+7'0
Corundum	342	598	256	..	+74'8
Soda	285	33	..	252	—88'4
Bismuth . . . . .	..	10	10	..	..
Borax	2	1	..	1	—50'0
Copperas	2	1	..	1	—50'0
Beryl	7	..	..	7	..
Serpentine	3	..	..	3	..
Total	25,819,365	22,919,947	737,124	3,636,542	—11'2
			—2,899,418		

(a) Value f.o.b.

(b) Export values.

(c) Revised.

II.—MINERALS OF GROUP I.

Antimony.

Antimonial lead is obtained as a bye-product in the lead refinery at the Namtu smelter of the Burma Corporation Limited. This product contains approximately 77 per cent. of lead, 21 per cent. of antimony and 6 to 8 ozs. of silver to the ton, and is exported to the United States of America for further treatment. The output of antimonial lead was 1,057 tons valued at Rs. 3,20,500 (£23,918) in 1926 and 503 tons valued at Rs. 1,33,065 (£9,930) in 1927.

There is also a small production of antimony-ore in the Amherst district, Burma, which rose from 108 tons valued at Rs. 2,688 (£201) in 1926 to 500 tons valued at Rs. 10,500 (£784) in 1927.

Chromite.

The production of chromite in India during 1927, showed the large increase of 23,825 tons to a total of 57,207 tons. For this increase the Hassan district, Mysore, was chiefly responsible. The total exports from India during the year amounted, however, only to 42,953 tons, with resultant accumulation of stocks. Chromite exported from the ports in British India amounted to 20,996 tons against 29,614 tons in 1926. Chromite mined in British India is also exported from the port of Mormugao in Portuguese India; the quantities exported during 1926 and 1927 were 10,337 tons and 21,957 tons respectively. This increased production accompanied an increase in the value per ton of chromite produced from Rs. 12·4 in 1926 to Rs. 15·4 in 1927.

TABLE 2.—*Quantity and value of Chromite produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value. (£1=Rs. 13·4.)		Quantity.	Value. (£1=Rs. 13·4.)	
<i>Baluchistan—</i>						
<i>Zhob . . .</i>	14,832	2,17,715	16,247	14,534	2,18,014	16,270
<i>Bihar and</i>						
<i>Orissa—</i>						
<i>Singhbhum .</i>	1,623	37,028	2,763	2,552	49,431	3,689
<i>Mysore State—</i>						
<i>Hassan . . .</i>	10,827	97,116	7,248	34,030	4,88,076	36,423
<i>Mysore . . .</i>	6,100	61,000	4,552	6,091	1,25,436	9,361
Total . . .	33,382	4,12,859	30,810	57,207	8,80,957	65,743

Coal.

There was a substantial increase during the year of 1,083,169 tons, or about 5·16 per cent., in the output of coal. This increase was due chiefly to Bengal, Bihar and Orissa, and to a lesser extent to Hyderabad, the Central Provinces and Assam, with a trivial increase in Central India. There was a decrease in the production of Rajputana, the Punjab and Baluchistan. The increase in Bengal was from the Raniganj field, and in Bihar and Orissa mostly from the Bokaro, Karanpura and Giridih fields. Bokaro now produces over 8 per cent. of the Indian product. Giridih again increased her raisings, the increase amounting to some 36,000 tons, while Karanpura jumped from a production of 123,867 tons in 1926 to over 262,000 tons in the year under review. Jharia showed a small proportionate increase of some 210,000 tons, and the output from Talchir again increased. There was a small initial production from Hutar. On the other hand, there were decreases in the output of Jainti, Daltonganj, Rampur and Ramgarh. In Central India, Sohagpur again failed to continue its former upward tendency and showed a further decline of some 26,000 tons. In the Central Provinces there was a substantial increase in the case of Pench Valley, and a smaller increase in the case of Ballarpur; the output of the Pench Valley was the highest yet recorded. For the increase in Hyderabad, Singareni was responsible, as the Sasti output fell by some 2,500 tons. All the Tertiary fields of Assam showed a moderate proportionate increase. In Baluchistan the Khost field continued its decline and the output dwindled to some 1,700 tons. The output from two of the three districts of the Punjab declined, whilst that of the third, Shahpur, increased. The Bikanir field of Rajputana showed a marked decrease in output.

In spite of the considerable increase in production during 1927 the statistical position at the end of the year was healthier than at the commencement, for stocks in the six provinces, Assam, Baluchistan, Bengal, Bihar and Orissa, the Central Provinces and the Punjab, for which such figures are available, showed a total reduction of 382,876 tons, as is seen from the following data :—

Year.	Opening stock.	Closing stock.	Reduction during year.
	Tons.	Tons.	Tons.
1926	2,660,062	2,161,806	498,256
1927	2,161,806	1,778,930	382 876

The reduction in stocks was shared by all provinces except Assam, which showed a trivial increase from 43 to 125 tons.

The total value of the coal produced in India decreased from Rs. 10,14,99,634 (£7,574,599) in 1926 to Rs. 9,48,70,013 (£7,079,852) in 1927.

There was a further reduction in the pit's mouth value per ton of coal for India as a whole from Rs. 4-13-4 to Rs. 4-4-9, but in contrast to the previous year all provinces did not participate in this fall. In the two great coal provinces Bihar and Orissa and Bengal, the value dropped by Rs. 0-9-7 and Rs. 0-12-7 respectively. In the Central Provinces it fell by Rs. 0-13-7; in Central India the fall was Rs. 0-2-10, and in the Punjab Rs. 0-2-3. The maximum fall, Rs. 1-1-1, was again in Baluchistan. These reductions are on a much smaller scale than those recorded in the two previous Reviews, and may perhaps indicate that the bottom of the market is being reached, especially if one correlates this fact with the additional fact that there has been an increase in output. In addition, three provinces show an increase, namely, Assam Rs. 4-13-10, Hyderabad Rs. 0-4-10 and Rajputana Rs. 0-10-7. This large increase in the value of the Assam coal is misleading, however. It appears that the value of the output of the Lakhimpur district has been seriously underestimated in previous years, revised figures for which have not yet been obtained.

TABLE 3.—*Provincial Production of Coal during the years 1926 and 1927.*

Province.	1926.	1927.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Assam	301,061	323,342	22,281	..
Baluchistan	15,586	14,444	..	1,142
Bengal	5,137,688	5,554,090	417,302	..
Bihar and Orissa	13,955,775	14,517,866	562,091	..
Central India	216,708	217,661	953	..
Central Provinces	635,252	666,758	31,506	..
Hyderabad	637,779	707,213	69,434	..
Punjab	68,043	62,704	..	5,339
Rajputana	31,275	17,358	..	13,917
Total .	20,999,167	22,082,336	1,103,567	20,398

TABLE 4.—*Value of Coal produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Value (£1=Rs. 13-4.)		Value per ton.	Value (£1=Rs. 13-4.)		Value per ton.
	Rs.	£		Rs.	£	
Assam	23,66,774	176,625	7 13 9	41,13,400	306,970	12 11 7
Baluchistan	1,47,463	11,004	9 7 5	1,21,255	9,049	8 6 4
Bengal	2,68,41,822	2,003,121	5 3 7	2,46,54,598	1,830,895	4 7 0
Bihar and Orissa	6,41,08,037	4,784,182	4 9 6	5,79,61,693	4,325,500	3 15 11
Central India	9,89,465	73,841	4 9 1	9,55,849	71,332	4 6 3
Central Provinces	33,41,762	249,385	5 4 2	29,40,268	219,423	4 6 7
Hyderabad (a)	30,12,893	224,843	4 11 7	35,54,461	265,258	5 0 5
Punjab	4,96,438	37,047	7 4 9	4,48,791	33,492	7 2 6
Rajputana	1,94,980	14,551	6 3 9	1,19,098	8,933	6 14 4
Total	10,14,93,6 1/4	574,599	..	9,48,70,013	7,072,552	..
<i>Average</i> . . . . .	..	..	4 13 4	..	..	4 4 9

(a) Estimated.

TABLE 5.—*Origin of Indian Coal raised during 1926 and 1927.*

	Average of last five years.	1926.	1927.
	Tons.	Tons.	Tons.
Gondwana Coalfields	19,893,025	20,583,202	21,664,488
Tertiary Coalfields	456,114	415,963	417,848
[Total	20,349,139	20,999,167	22,082,336

TABLE 6.—Output of Gondwana Coalfields for the years 1926 and 1927.

Coalfields.	1926.		1927.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Bengal, Bihar and Orissa—</i>				
Bokaro	1,514,918	7.21	1,790,594	8.11
Daltonganj	9,757	0.05	..	..
Giridih	818,681	3.90	855,253	3.87
Hutar . . . . .	..	..	709	..
Jainti	82,604	0.39	56,724	0.26
Jharia	10,373,736	49.40	10,583,487	47.93
Karanpura	123,867	0.59	262,014	1.19
Rajmahal Hills	1,788	0.01	1,488	0.01
Ramgarh	585	..	340	..
Rampur (Raigarh-Hingir)	29,272	0.14	26,895	0.12
Raniganj	6,124,884	29.17	6,472,036	29.31
Talchir	13,371	0.07	23,316	0.10
<i>Central India—</i>				
Sohagpur	108,599	0.52	82,541	0.37
Umaria	108,109	0.51	135,120	0.61
<i>Central Provinces—</i>				
Ballarpur	142,935	0.68	158,617	0.72
Mohpani	71,482	0.34	..	..
Pench Valley	416,708	1.98	505,913	2.29
Shahpur	423	..	6	..
Yeotmal	3,704	0.02	2,222	0.01
<i>Hyderabad—</i>				
Sasti	28,034	0.14	25,477	0.12
Singareni	609,745	2.90	681,736	3.09
Total	20,583,202	98.02	21,664,488	98.11

TABLE 7.—Output of Tertiary Coalfields for the years 1926 and 1927.

—	1926.		1927.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Assam—</i>				
Khasi and Jaintia Hills	555	1.43	825	1.46
Makum	255,189		271,220	
Naga Hills	45,317		51,297	
<i>Baluchistan—</i>				
Khost	3,545	0.07	1,734	0.07
Sor Range, Mach, Kalat	12,041		12,710	
<i>Punjab—</i>				
Jhelum	46,961	0.33	39,545	0.28
Mianwali	15,644		15,488	
Shahpur	5,438		7,671	
<i>Rajputana—</i>				
Bikanir	31,275	0.15	17,358	0.08
Total	415,965	1.98	417,848	1.89

The export statistics for coal during 1927 show a small decrease amounting to some 43,000 tons, the total exports of coal and coke falling from 617,563 to 576,167 tons, 2,510 tons of the latter being coke (*see* Table 8). As before, the major portion of the exports was to Ceylon, which took a largely increased quantity of coal; substantial and increased quantities of coal were also sent to the Straits Settlements, the Philippine Islands and Guam, whilst exports to the westerly markets of Aden, Egypt and the United Kingdom ceased. This small decrease in total exports reflects the difference between the loss of the westerly markets named, which were secured temporarily in 1926 on account of the coal strike in England, and the continued recovery of markets in the east. If we exclude these westerly markets from the comparison, then we find that exports to normal markets expanded from 216,088 tons in 1925 to 400,008 tons in 1926 and 573,771 tons in 1927.

TABLE 8.—*Exports of Indian Coal and Coke during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
	Tons.	Rs.	£	Tons.	Rs.	£
To—						
Aden and Dependencies.	59,342	7,42,971	55,446	..	..	..
Ceylon . . .	242,685	33,19,630	247,783	340,546	[44,78,416	333,837
Egypt . . .	105,711	13,39,340	99,951	..	..	..
Philippine Islands and Guam.	12,968	1,34,447	10,033	56,052	[4,85,349	36,220
Straits Settlements (including Labuan).	117,246	15,15,873	113,125	145,933	16,06,709	119,904
United Kingdom .	51,363	5,51,295	41,141	62	[2,920	218
Other countries .	27,109	2,96,054	22,094	31,240	3,55,526	26,532
TOTAL .	616,424	78,90,610	589,523	573,833	69,23,920	516,711
Coke	1,189	33,636	2,510	2,334	52,193	3,895
Total of Coal and Coke .	617,563	79,33,246	592,033	576,167	69,76,113	520,606

These largely increased normal export figures are, however, still below those of some earlier years, (*e.g.*, 1,224,758 tons in

1920); but as they are mainly the result of the first two years' operations of the Indian Coal Grading Board established for the purpose of certifying the quality of coal exported from the port of Calcutta, they must be taken as a favourable augury for the future prospects of this scheme for the rehabilitation of Indian coal in foreign markets, especially as the expansion for 1927 is but very little lower than that for 1926. The following table shows the amounts of different grades of coal exported during 1926 and 1927 under this scheme, (including sea-borne coal for railways in Southern India, for which no Grade Shipment Certificates were issued by the Coal Grading Board), the difference between the total amounts so exported (2,224,173 tons in 1927) and the total exports of Indian coal to foreign ports given in Table 8 (573,833 tons in 1927) being the amount of coal exported to Indian ports.

TABLE 9.—*Exports of Coal under Grading Board Certificates during 1926 and 1927.*

	1926.	1927.
	Tons.	Tons.
Selected Grade	943,821	1,733,880
Grade I	228,640	373,632
Grade II	28,135	22,068
Grade III	7,822	4,054
Mixed grades	82,522	80,935
Under reference	193,361	9,604
Sea-borne coal for railways in S. India for which grade shipment certificates were not issued.	354,630	..
Total .	1,838,931	2,224,173

The imports at the same time, following the heavy drop recorded in the previous Review, rose from 193,908 tons to 243,603 tons, 7,311 tons of the latter consisting of coke (see Table 10). This increase is due to a rise in the imports from South Africa and the United Kingdom, partially set off by a fall in the imports from Portuguese East Africa. The total imports are now only about half those of the pre-war quinquennium,

and the table 10A comparing pre-war imports and exports with the 1927 figures shows that it is no longer possible to attribute depression in the Indian coal industry to the competitive effect of foreign imported coal. The surplus of exports over imports during 1926 and 1927 was in fact of the same order of magnitude as the surplus during the pre-war quinquennium.

TABLE 10.—*Imports of Coal and Coke during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4.)		Quantity.	Value (£1 = Rs. 13·4.)	
	Tons.	Rs.	£	Tons.	Rs.	£
From—						
Australia . . .	13,323	3,79,656	28,333	11,017	2,94,405	21,971
Portuguese East Africa	46,044	9,58,465	71,527	29,314	6,74,391	50,328
Union of South Africa	84,950	18,03,105	134,560	132,357	28,88,518	215,561
United Kingdom . .	21,374	5,74,089	42,842	50,209	13,67,207	102,030
Other countries . .	9,087	1,72,360	12,863	13,395	2,99,360	22,340
TOTAL	174,784	38,87,675	290,125	236,292	55,23,881	412,230
Coke	10,124	6,13,015	45,747	7,311	2,90,262	21,661
Total of Coal and Coke.	193,903	45,00,690	335,872	243,603	58,14,143	533,891

TABLE 10A.—*Excess of Exports over Imports of Coal.*

Year.	Exports.	Imports.	Excess of exports over imports.
	Tons.	Tons.	Tons.
Average for 1909-1913	814,475	466,162	348,313
1926	617,563	193,908	423,655
1927	576,167	243,603	332,564

The average number of persons employed in the coalfields during the year showed an appreciable decrease in spite of the substantial increase in production. The average output per person employed, therefore, again showed an advance on the previous year, the figure of 110·5 tons for 1925 rising to 113·1 tons for 1926 and 122·3 tons in

1927; the figures for the last two years are higher than has previously been recorded, and indicate a higher average grade of efficiency in the mines at work than has hitherto been attained. This increased output per person employed is specially marked in Assam, Bengal, Bihar and Orissa, the Central Provinces and Hyderabad. There was, however, a small increase in the number of deaths by accident; these amounted to 196, which is, nevertheless, a considerable improvement on the annual average for the quinquennium 1919-23, which was 274; in addition, it relates to production $2\frac{1}{2}$ million tons in excess of the average for 1919-23. The death-rate was 1.1 per thousand persons employed in 1927 against 0.99 for 1926; the average figure for the period 1919-23 was 1.36,

TABLE 11.—*Average number of persons employed daily in the Indian Coalfields during the years 1926 and 1927.*

	Number of persons employed daily.		Output per person employed, in tons.	Number of deaths by accident.	Death-rate per 1,000 persons employed.
	1926.	1927.			
Assam	4,523	4,034	Tons. 80.2	11	2.7
Baluchistan	232	323	44.7	1	3.1
Bengal	43,498	44,274	125.5	36	0.8
Bihar and Orissa	112,945	109,196	133.0	122	1.1
Central India	2,497	3,259	66.8	2	0.6
Central Provinces	8,306	6,553	101.8	7	1.1
Hyderabad	12,134	11,464	61.7	13	1.1
Punjab	1,388	1,260	49.8	4	3.2
Rajputana	166	169	102.7	..	..
Total .	185,749	180,532	..	196	..
Average .	..	..	122.3	..	1.1

It is of interest to summarize the changes in the coal position during 1927 as revealed by the foregoing statistics. In spite of an increased output of over 1 million tons, or 5 per cent., during 1927, compared with the trivial increase of $\frac{1}{2}$ per cent. during 1926, the fall in the average pit's mouth value of coal, as exemplified by the chief producing province, Bihar and Orissa, was less than in the preceding year, viz., from Rs. 4-9-6 to Rs. 3-15-11 against the fall from Rs. 5-11-3 per ton in 1925 to Rs. 4-9-6 in 1926. This decrease in the rate of fall in price may be correlated with increased exports of Indian coal to eastern ports during 1927, with increased exports of coal under Grading Board certificates to foreign and Indian ports, and also with the fact that a much larger proportion of the coal exported under Grading Board certificates consisted of selected grade coal during 1927 than in 1926. Imports increased slightly, but to a smaller extent than the increase in exports to eastern ports; the excess of exports over imports was on a pre-war scale. The average output per person employed increased, and deaths by accident were below the average for the last quinquennial period. There was a reduction in stocks at the mines during the year, slightly greater than the excess of exports over imports. These factors, considered together, suggest that the Indian coal industry is now reaching a position of relative stability, that production has adjusted itself to demand, and that the point has been reached at which a further serious fall in prices is improbable. The data indicate that this position has been reached by an increasing proportional production from the seams of higher grade coal by the better organised companies.

Copper.

Work at the Mosaboni Mine of the Indian Copper Corporation, Ltd., in the Singhbhum district, was practically suspended during the year 1926, pending the raising of the capital required for the erection of the necessary concentrating, smelting, refinery and power plants. Early in 1927 the Anglo-Oriental and General Investment Trust, Ltd., London, assumed control, a sum of £350,000 was subscribed and the erection of the new plant commenced at once at the company's new site at Moubhandar, Ghat-sila, together with an assisted siding from the Bengal-Nagpur Railway main line at Ghatsila, and an aerial ropeway from the mine.'

The ore reserves (surface and underground) now amount to 624,539 short tons, with an average assay value of 3.88 per

cent. copper representing a copper content of 24,232 tons. The quantity of ore raised in 1927 was 5,000 tons valued at Rs. 2,00,000 (£14,925). This is in addition to 35,823 tons previously produced during development.

In addition there is now a regular production of copper matte at the Namtu smelting plant of the Burma Corporation, Ltd., assaying on the average about 41 per cent. of copper, 35 per cent. of lead and 70 ounces of silver to the ton. The production during 1926 was 11,441 tons valued at Rs. 44,78,064 (£331,184) and averaging 41·6 per cent. of copper and during 1927, 11,872 tons valued at Rs. 44,13,205 (£329,344) averaging 40·3 per cent. of copper. The matte is exported to Hamburg for further treatment.

A small output in 1926 of 4 tons of copper ore valued at Rs. 160 (£12) and in 1927 of 10 tons valued at Rs. 400 (£30) was reported from the Nellore district of Madras.

Diamonds.

The production of diamonds in Central India rose from 68·60 carats valued at Rs. 28,559 (£2,131) in 1926 to 112·74 carats valued at Rs. 44,943 (£3,354) in the year under review.

Gold.

In 1927 there was an arrest in the secular decline in the total Indian gold production. A small decrease of some 1,176 ounces from Mysore and the cessation of the abnormal production of gold in Singhbhum in 1927 was more than counterbalanced by an enhanced output from the new lease of the North Anantapur Gold Mines, Ltd., in the Anantapur district of Madras. Although this company ceased operation in July 1927, yet the net result was an increase of 114 ounces in the total gold output of India.

Of the five mines producing gold on the Kolar Gold Field the Champion Reef and the Ooregum mines attained vertical depths of 6,610·5' and 6,483·5' respectively below field datum at the close of the year 1927. There has been a slight drop in the estimated ore reserves mainly due to restricted development operations, but the deepest points so far reached indicate that further exploration will probably permit an increased estimate. Brick and concrete-lined shafts and winzes are coming more and more into prominence,

as they greatly facilitate the ventilation of the deeper levels. Rockbursts still continue to give trouble, and experiments are being made to minimise their effects by substituting a more rigid form of support instead of the usual timbering and waste rock filling of the excavations. Systematic building of granite packwalls in stopes in the Ooregum mine and filling the bottom of levels with mass concrete in the Champion Reef mine are being tried to prevent the sagging of the hanging wall, and it is hoped that the frequency of rockbursts will be reduced by this new method. The persistence of payable oreshoots in the deeper levels is a very encouraging feature of this year's development work.

Owing to the great depth of the mines and the high rock temperatures—117° F. in the bottom workings—the problem of ventilation has been an extremely difficult one. It has been solved to some extent by sinking deep vertical shafts and by an extensive use of large electrically driven fans to help the main air currents.

The total number of persons employed in the Kolar mines is 18,918.

TABLE 12.—*Quantity and value of Gold produced in India during the years 1926 and 1927.*

	1926.			1927.			Labour.
	Quantity	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).		
	Ozs.	Rs.	£	Ozs.	Rs.	£	
<i>Bihar and Orissa— Singhbhum . . .</i>	123-0	6,600	408	..	..	..	..
<i>Burma— Katha . . .</i>	24-2	1,491	111	11-5	778	58	8
<i>Upper Chindwin. . .</i>	122-4	11,127	830	48-2	4,169	311	115
<i>Kashmir . . .</i>	46-7	1,995	149	48-0	2,048	153	128
<i>Madras— Anantapur . . .</i>	(a) 930-0	53,219	3,972	(a) 2,395-0	1,37,320	10,248	411
<i>Mysore . . .</i>	(a) 382,899-8	2,16,89,632	1,618,629	(a) 381,723-0	2,16,54,394	1,615,999	18,918
<i>Punjab . . .</i>	8-8	444	33	42-5	1,645	123	60
<i>United Provinces</i>	4-1	275	21	4-3	275	21	16
Total . . .	384,156-5	2,17,64,753	1,624,233	384,272-5	2,18,00,629	1,626,913	19,656

(a) Fine gold.

Iron.

The production of iron-ore in India has been steadily on the increase; in 1927 there was an increase over the previous year of 11·3 per cent., amounting to 187,440 tons. The figures shown against the Mayurbhanj State in Table 13 represent the production by the Tata Iron and Steel Co., Ltd., whilst of that recorded against Singhbhum 507,580 tons were produced by the Tata Iron and Steel Co., Ltd., from their Noamundi mine, 302,258 tons by the Bengal Iron Co., Ltd., from their Pansira, Ajita and Maclellan mines, and 191,724 tons by the Indian Iron and Steel Co., Ltd., from their mines at Gua; the remaining 5,475 tons were produced by two other firms. The output of iron-ore in Burma is by the Burma Corporation, Limited, and is used as a flux in lead smelting.

TABLE 13.—Quantity and value of Iron-ore produced in India during the years 1926 and 1927.

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Bihar and Orissa—</i>					(a)	
Keonjhar . . . .	..	..	..	36,325	1,08,975	8,132
Mayurbhanj	1,041,920	31,25,787	233,267	692,137	20,76,411	1,54,950
Sambalpur	569	3,930	293	561	3,930	293
Singbhum	552,079	12,84,922	95,890	1,007,037	25,34,346	189,130
<i>Burma—</i>					(a)	
Northern Shan States .	(a) 43,089	1,92,356	14,355	61,062	2,44,248	18,228
Central India	230	1,406	105	230	1,410	105
Central Provinces	972	3,987	298	918	3,846	287
Mysore	(b) 15,427	73,278	5,468	48,465	1,28,695	9,604
Total .	1,659,295	46,35,666	349,676	1,946,735	51,01,361	380,735

(a) Estimated.

(b) Excludes 1,909 tons of hæmatite quartzite.

The output of iron and steel by the Tata Iron and Steel Co., Ltd., at Jamshedpur works again showed an increase; the production of pig-iron rose from 609,429 tons in 1926 to 624,028 tons in 1927, and of steel (including steel rails) from 360,980

tons in 1926 to 414,738 tons in 1927; but the production of ferro-manganese fell from 10,503 tons in 1926 to 5,092 tons in 1927. The production of pig-iron by the Bengal Iron Co., Ltd., recovered from the low figures of 52,674 tons in 1925 and 20,050 tons in 1926 to 132,649 tons in 1927; their output of products made from this pig-iron increased, however, from 44,454 tons of sleepers and chairs and 26,364 tons of pipes and other castings in 1926 to 61,494 tons and 26,431 tons respectively in 1927. There was a large increase in the production of pig-iron by the Indian Iron and Steel Co., Ltd., from 253,431 tons in 1926 to 363,516 tons in 1927.

The Mysore Iron Works commenced producing pig-iron in 1923, when the quantity manufactured amounted to 9,732 tons; in the year under review the output of pig-iron amounted to 19,858 tons against 19,523 tons in 1926.

The number of indigenous furnaces that were at work in the Central Provinces during the year 1927 for the purpose of smelting iron-ore was 5 less than in the previous year; 95 furnaces were operating in the Bilaspur district, 48 in Raipur, 47 in Mandla, 11 in Drug, 3 in Saugor and 1 in Jubbulpore, making 206 in all.

There was a further increase in the production of pig-iron in India from 902,433 tons in 1926 to 1,140,051 tons, whilst the quantity exported rose from 309,505 tons in 1926-27 to 393,249 tons in 1927-28. Table 14 will show that Japan was the principal consumer of Indian pig-iron in 1927-28, nearly 69 per cent. of the total exports going to that country. There was a very slight rise in the export value, which was Rs. 45.1 (£3.37) per ton in 1926-27 and Rs. 45.4 (£3.39) in the following year.

The Steel Industry (Protection) Act, 1924 - Act No. XIV of 1924—authorised, to companies employing Indians, bounties, which were granted upon rails and fishplates wholly manufactured in British India from material wholly or mainly produced from Indian iron-ore and complying with specifications approved by the Railway Board, and upon iron or steel railway wagons a substantial portion of the component parts of which had been manufactured in British India. This Act was repealed by the Act No. III of 1927 and consequently the payment of bounties ceased on the 31st March 1927, but the Industry is protected to a certain extent by varying tariffs on different classes of imported steel.

TABLE 14.—Exports of Pig-iron from India during 1926-27 and 1927-28.

	1926-27.			1927-28.		
	Quantity.	Value (£1—Rs. 13-4).		Quantity.	Value (£1—Rs. 13-4).	
	Tons.	Rs.	£	Tons.	Rs.	£
To—						
United Kingdom	16,159	7,29,617	54,449	21,060	9,51,228	70,987
Germany	2,868	1,29,056	9,683	12,227	5,50,157	41,057
Italy	858	38,607	288	2,958	1,33,931	9,995
China	7,616	3,31,296	24,724	4,009	2,25,865	16,817
Japan	234,529	1,05,71,787	788,939	270,956	1,23,54,921	922,009
United States of America	40,733	18,33,744	136,847	65,064	29,22,187	218,074
Other countries	6,742	3,29,146	27,166	16,975	7,37,350	55,026
Total	309,535	1,39,63,283	1,042,036	393,249	1,78,75,134	1,333,965

Jadeite.

The fall in the output of jadeite, which commenced after the year 1922, has now ceased, and the output, which in 1926 amounted to only 1,203·9 cwts. valued at Rs. 2,34,456 (£17,497) increased in 1927 to 2,227 cwts. valued at Rs. 2,39,064 (£17,841). The output figures are liable to be incomplete, and a more correct idea of the extent of the Burmese jadeite industry is sometimes obtainable from the export figures. Exports by sea fell slightly from 2,139 cwts. valued at Rs. 4,70,225 (£35,091) in 1926-27 to 1,961 cwts. valued at Rs. 3,02,440 (£22,570). The shipments were made entirely from Burma. These figures exclude exports by land across the frontier to foreign countries as the registration of the Land Frontier Trade of Burma has been discontinued. The average exports for the past 4 years have amounted to a little less than half the average figures for the previous three quinquennial periods (4,660 cwts. annually).

Lead.

Corresponding to an increase in the production of lead-ore at the Bawdwin mines of Burma, the total amount of metal extracted increased from 54,330 tons of lead including 1,057 tons of antimonial lead, valued at Rs. 2,25,94,634 (£1,686,167) in 1926, to 65,967 tons of lead including 503 tons of antimonial lead, valued at Rs. 2,20,27,742 (£1,643,861) in 1927. The quantity of silver extracted from Bawdwin ores also increased from 5,103,646 ozs. valued at Rs. 88,49,722 (£660,427) in 1926 to 6,004,437 ozs. valued at Rs. 94,67,196 (£706,507) in 1927. The value of both lead and silver fell respectively from Rs. 415·8 (£31·0) per ton and Rs. 1-11-9 (31·06d.) per oz. in 1926 to Rs. 333·9 (£24·9) per ton and Rs. 1-9-3 (28·24d.) per oz. in the year under review.

TABLE. 15.—*Production of Lead-ore, Lead and Silver during the years 1926 and 1927.*

	1926.						1927.					
	Quantity.		Value. (£1 = Rs. 13-4).				Quantity.	Value. (£1 = Rs. 13-4).				
			Lead-ore and lead.		Silver.			Lead-ore and lead.		Silver.		
	Lead-ore.	Tons.	Rs.	£	Ra.	£	Lead-ore.	Tons.	Ra.	£	Ra.	£
Burma—												
Northern Shan States	362,505	(a) 2,25,94,634	1,686,167	(b) 88,49,722	660,427	449,817	(c) 2,20,27,742	1,643,861	94,67,196(d)	706,507		
Southern Shan States	375	55,995	4,179	..	..	960	96,000	7,164	..	..
Yamethin . .	24	960	72	..	..	..	..	..	..	..
Reiputana—												
Jalpur State . .	6-6	1,170	87	..	..	..	..	..	..	..
Total	362,910-6	2,26,52,759	1,690,305	88,49,722	660,427	450,777	2,21,23,742	1,651,026	94,67,196	706,507		

(a) Value of 53,273 tons of lead (Rs. 2,22,74,134) and 1,057 tons of antimonial lead (Rs. 3,20,500) extracted.

(b) Value of 5,103,646 oz. of silver extracted.

(c) Value of 65,464 tons of lead (Rs. 2,18,94,677) and 503 tons of antimonial lead (Rs. 1,33,085) extracted.

(d) Value of 6,004,437 ozs of silver extracted.

Magnesite.

In 1926 the total Indian magnesite production was the highest yet recorded, namely, 30,461 tons valued at Rs. 3,54,355 (£26,444). In 1927 the production fell seriously to 19,638 tons valued at Rs. 2,29,338 (£17,115). The output for 1927 is, however, about the same as the average for the three years 1921 to 1923.

TABLE 16.—*Quantity and value of Magnesite produced in India during 1926 and 1927.*

	1926.			1927.		
	Quantity.		Value (£1 = Rs. 13·4).	Quantity.		Value (£1 = Rs. 13·4)
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Madras—</i>						
Salem	28,676	3,41,925	25,517	16,966	2,02,656	15,124
<i>Mysore State</i>	1,785	12,430	927	2,672	26,682	1,991
Total .	30,461	3,54,355	26,444	19,638	2,29,338	17,115

Manganese.

A rise in the output of manganese-ore in India has again to be recorded, the total for 1926, 1,014,928 tons, valued at £2,590,357 f. o. b. Indian ports, rising to 1,129,353 tons, valued at £2,844,237 f. o. b. Indian ports during the year under consideration. The figures for output in 1926 and 1927 are the highest yet recorded and exceed that for 1907, when 902,291 tons were raised. It will be noticed that concurrently with a rise in output there was, also, in contrast to the change recorded in the previous year, a rise in value, the total value for 1927 being £253,880 greater than that for 1926. In 1924 first-grade ore c. i. f. United Kingdom ports fetched an average price of 22·9*d.* per unit; in 1925 this price fell to 21·5*d.* and in 1926 to 18*d.* During 1927 the price fell from 19·9*d.* in January to 16·5*d.* in September and recovered to 17*d.* in December, the average for the year being again 18*d.* Consequently the increase in total value is proportionate to the increase in total quantity. A fall in price was anticipated in view of the agreement, two or three years ago, between an American group of financiers and the Soviet Government for the development on modern

lines of the manganese-ores of the Caucasus ; the extent to which meanwhile such developments have actually taken place is not known, but from 1925 onwards there has been a large increase in the total output of Russia and Georgia, but only to figures that obtained before the war. Difficulties over the carrying out of the concession appear to have been frequent, and it is now reported that the group in question have decided to abandon the concession. There appears to be no reason for supposing that this will produce any serious effect upon the market for manganese-ore.

In addition to the four chief manganese-producing areas, India, Georgia (with Russia), Brazil and the Gold Coast, a further source at Postmasburg in the northern part of the Cape Province is promising ; the grade is high and the deposits extensive, the only drawback being the presence of aluminous compounds.

The increase in the Indian output is shared by all provinces except the Central Provinces and by almost all districts, the only decreases being in Gangpur State in Bihar and Orissa and the Bhandara and Balaghat districts in the Central Provinces and the Bellary district in Madras. In the case of the output from Bihar and Orissa substantial increases occurred in Keonjhar and Singhbhum. In the Bombay Presidency the Panch Mahals showed a large increase to nearly 79,000 tons, the highest figure hitherto recorded. Chota Udaipur and Belgaum show small increases, whilst the initial production recorded from North Kanara in 1926 was doubled. After a break of several years Jhabua State in Central India had resumed production in 1924 ; it shows a third substantial increase amounting to 2,541 tons in the year under review. The most important Indian manganese area, namely, the Central Provinces, shows however, a decrease of some 17,500 tons in 1927 as contrasted with an increase of over 139,000 tons in 1926, the decreases in Balaghat and Bhandara being only partly balanced by the increase in the Nagpur district. In Madras the output of Sandur State increased by over 60,000 tons to 138,196 tons, the previous highest production being 97,091 tons in 1907. There is also a substantial increase in Vizagapatam and a small decrease in Bellary. Mysore shows a small total increase in output shared by the three producing districts.

The exports of manganese-ore, which fell in 1926 by 125,300 tons, increased in 1927 by 230,000 tons to 843,821 tons, as shown in Table 18. The highest export recorded was 862,777 tons in 1922. There is a steady consumption of manganese-ore at the works of the three pri-

cipal Indian iron and steel companies, not only for use in the steel furnaces of the Tata Iron and Steel Company, and the manufacture of ferro-manganese, but also for addition to the blast-furnace charge in the manufacture of pig-iron. The consumption of manganese-ore by the industry in 1927 was 39,065 tons, some 2,000 tons less than in the previous year.

TABLE 17.—*Quantity and value of Manganese-ore produced in India during 1926 and 1927.*

	1926.		1927.	
	Quantity.	Value f.o.b. at Indian ports.	Quantity.	Value f.o.b. at Indian ports.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Gangpur State	10,379	26,856	7,960	20,928
Keonjhar State	23,810	47,322	51,115	103,721
Singhbhum	2,473	6,399	9,970	26,213
<i>Bombay—</i>				
Chhota Udaipur	10,000	25,500	11,729	30,398
Belgaum	4,290	10,100	4,515	11,871
North Kanara	2,000	5,175	4,005	10,530
Panch Mahals	57,325	148,328	78,802	207,184
<i>Central India—</i>				
Jhabua State	7,969	16,901	10,510	22,728
<i>Central Provinces—</i>				
Balaghat	336,579	921,385	313,556	871,424
Bhandara	152,858	418,449	130,211	361,878
Chhindwara	42,242	115,637	47,264	131,355
Jubbulpore	100	274	181	503
Nagpur	229,586	628,492	252,637	702,120
<i>Madras—</i>				
Bellary	8,853	14,054	6,004	9,782
Sandur State	77,327	122,757	138,196	225,144
Vizagapatam	21,698	37,339	31,992	56,386
<i>Mysore State—</i>				
Chitaldrug	1,599	2,645	4,021	6,819
Shimoga	23,032	38,099	23,658	40,120
Tumkur	2,808	4,645	3,027	5,133
Total	1,014,928	2,590,357	1,129,353	2,844,237

Table 19 shows the distribution of the manganese-ore exported from British Indian ports (excluding the Portuguese port of Mormugao) during 1926 and 1927, from which it will be seen that the amount absorbed by the United Kingdom in 1927 was nearly three times what it was in 1926, and that the United Kingdom has recovered her posi-

tion as the chief importer of Indian manganese-ore. The quantity exported to Belgium fell by 11,500 tons, but even so this country is not far behind Britain. France maintained her previous figure; small declines in the cases of Holland and Italy were amply balanced by a large increase on the part of the United States and smaller increases by Germany and Japan.

TABLE 18.—*Exports of Manganese-ore during 1926 and 1927 according to Ports of Shipment.*

Port.	1926.	1927.
	Tons.	Tons.
Bombay	222,371	249,360
Calcutta	291,745	418,173
Madras	9,800	13,910
Mormugao (Portuguese India)* . .	89,620	162,378
Total .	613,536	843,821

* In addition 2,376 tons of manganese-ore produced in Portuguese India were exported.

TABLE 19.—*Exports of Manganese-ore from British Indian Ports during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1=Rs. 13·4).		Quantity	Value (£1=Rs. 13·4).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>To—</i>						
United Kingdom . .	74,750	20,80,509	155,262	211,401	55,09,751	411,176
Germany	6,346	1,48,800	11,104	12,805	2,99,967	£2,386
Netherlands	14,800	4,25,125	31,728	12,500	3,52,000	26,209
Belgium	185,974	51,25,666	382,512	174,485	50,33,543	375,637
France	151,906	42,60,342	317,936	151,100	41,84,919	312,307
Italy	9,600	4,00,398	29,880	5,150	1,85,250	13,825
Japan	8,290	2,31,854	17,303	15,602	3,44,481	25,708
United States of America	67,250	20,15,500	150,411	97,500	27,22,502	203,171
Other countries . . .	5,000	75,000	5,597	1,000	34,250	2,556
Total .	523,916	1,47,63,194	1,101,731	681,443	1,86,66,663	1,392,035

Mica.

There was a small increase in the declared production of mica from 41,924 cwts. valued at Rs. 22,19,367 (£165,624) in 1926 to 42,614 cwts. valued at Rs. 24,52,055 (£182,989) in 1927. As has been frequently pointed out, the output figures are incomplete, and a more accurate idea of the size of the industry is to be obtained from the export figures. It will be seen from table 21 that in both the years 1926 and 1927 the quantity exported was roughly double the reported production. The United States of America and the United Kingdom, which are the principal importers of Indian mica, absorbed 52 per cent. and 35 per cent. respectively of the total quantity exported during 1926 and 23·7 per cent. and 49·4 per cent. respectively during 1927. During this latter year Germany took 14·2 per cent. of the quantity exported. The average value of the mica exported fell slightly from Rs. 122 (£9·1) per cwt. in 1926 to Rs. 119·5 (£8·9) per cwt. in 1927.

The difference between exports and production is generally attributed to theft from the mines and early in 1928 a bill was introduced into the Legislative Council of Bihar and Orissa, the purpose of which was to attempt to reduce the losses on this account by licensing miners and dealers. The bill was, however, rejected.

TABLE 20.—Quantity and value of Mica produced in India during the years 1926 and 1927.

	1926.			1927.			
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4)		
		Cwts.	Rs.		£	Cwts.	Rs.
<i>Bengal—</i>							
Bankura	4	233	17	..	..	..
<i>Bihar and Orissa—</i>							
Gaya	1,782	1,21,855	9,094	1,513	1,08,928	8,129	
Hazaribagh	26,789	13,46,376	100,476	29,419	16,07,216	119,942	
Monghyr	743	39,808	2,971	615	28,063	2,094	
Sambalpur	11	500	37	17	418	31	
Gwalior	320	10,548	787	240	7,431	555	
<i>Madras—</i>							
Nellore	11,271	5,98,532	44,667	9,265	5,93,374	44,281	
Nilgiris	313	45,152	3,369	281	39,012	2,956	
<i>Rajputana—</i>							
Ajmer-Merwara	538	46,863	3,497	971	49,752	3,713	
Jipur . . . . .	..	..	..	4	400	30	
Shahpura	153	9,500	709	289	16,863	1,258	
Total	41,924	22,19,367	165,624	42,614	24,52,055	182,989	

TABLE 21.—*Quantity and value of Mica exported from India during the years 1926 and 1927.*

To—	1926.			1927.		
	Quantity.		Value (£1 = Rs. 13·4).	Quantity.		Value (£1 = Rs. 13·4).
	Cwts.	Rs.		Cwts.	Rs.	
United Kingdom . .	31,618	44,13,886	329,394	38,298	43,00,239	320,913
Germany	4,984	3,97,105	29,635	11,014	8,69,478	64,887
France	1,340	2,69,680	20,122	3,876	3,71,246	27,705
United States of America .	47,038	51,94,255	387,631	18,410	30,73,548	229,369
Other countries . .	4,967	7,25,201	54,119	5,890	6,49,461	48,467
Total .	89,947	1,10,00,077	820,901	77,488	92,63,972	691,341

Monazite.

The monazite industry of Travancore, which was almost dead in the year 1925, when the reported production was 1 cwt. only, showed signs of revival in 1926, the output amounting to 64·2 tons valued at £947. This revival continued in 1927, when the output increased to 280 tons valued at £3,810. The decline of the industry is of course due to the supplanting of incandescent mantles for gas lighting by electricity. It is hoped that ilmenite collected with the monazite and hitherto regarded as a bye-product may be the means of reviving the whole industry. Titania forms a valuable white paint superior to white lead in being non-poisonous and in possessing twice the covering power.

Nickel.

As a bye-product in the smelting operations of the Burma Corporation, Limited, at Namtu, in the Northern Shan States, there is now a regular production of nickel speiss, which is exported to Hamburg for further treatment. Figures of production have not been received. The first sales, which occurred during 1927, were of 814 tons averaging 24 per cent. of nickel and valued at Rs. 1,34,978 (£10,073). Such speiss

contains, in addition, some 10 per cent. of copper and 30 ozs. of silver to the ton.

Petroleum.

The world's production of petroleum in 1926 amounted to a little over 151½ million tons, of which India contributed 0·79 per cent. In 1927 the world's production jumped to some 171 million gallons, of which the Indian proportion on a practically stationary production fell to 0·72 per cent. India is now eleventh on the list of petroleum producing countries, having been overtaken during 1927 by Columbia and Argentina. In the previous Review attention was drawn to the effect on prices of the greatly increased production of the United States and of the expansion in the output of light petroleum distillates obtained by cracking and from casing-head sources. In 1927 prices fell still lower in India at the same time as large supplies of kerosine from Georgia and Russia made their appearance on the Indian market.

As remarked before, petroleum statistics prove that it is becoming more and more difficult to maintain the output of India (including Burma) at the high levels it reached in 1919 and 1921, when peak productions of well over 305½ million gallons were reached. During the year under consideration, the total production amounted to a little over 281 million gallons against less than 280½ million gallons in 1926 and a little over 289½ million gallons in 1925. Although, therefore, this year there has not been an actual decrease, this can only be regarded as an arrest in the decline that has set in, and which, with possible interruptions, is likely to continue slowly and steadily during the present generation, unless a new field of importance is discovered. The changes of the latter recede year by year as exhaustive geological research continues to prove fruitless. A conservative policy rather than one of intensive development seems indicated, especially in view of the national importance of this mineral asset. In contrast with the almost stationary figure of output in 1926 and 1927, the value of the oil produced fell enormously from over 7 millions sterling in 1926 to less than 4½ millions sterling in 1927.

As before, the Yenangyaung field of Upper Burma shows a decided decrease in output. In 1924 it succeeded in showing an increase of nearly 6½ million gallons, but this temporary arrest in the decline was more than balanced by the drop in 1925 of over 21½ million

gallons; in 1926 the drop amounted to 14½ million gallons; and in 1927 to 8½ million gallons. It is interesting to note that the production in Yenangyaung still includes oil derived from the old Burmese hand-dug wells.

It is now seldom that a new well strikes a yield of over 100 barrels per initial 24 hours. The utilization of the shallow oil-sands of this field, which were shut off during the competitive rush for the richer deep sands, continues; many remunerative wells are now being worked from two shallow zones, one at about 350 feet and the other at about 650 feet, and the production from shallow wells during 1927 amounted, in fact, to nearly 14 per cent. of the total production from the field. In spite of the fact that the fall in the yield of these wells is unexpectedly gradual, the effect in delaying the decline of the field may be looked upon as but temporary. The average daily yield of these shallow wells is about 2 barrels. The electrification of the field, which reached its limit of practicability in 1924, has added and is adding an appreciable contribution to the production figure, owing to the saving of a considerable quantity of crude oil formerly used as fuel beneath rig boilers.

Of the companies operating in this small field the Burmah Oil Company produce about four-fifths of the total output. Of undrilled portions of the Yenangyaung field the northern areas are showing more promise than the southern. There is now good reason to believe that as the depth increases, the crest of the anticline recedes more and more to the east; this means that the producing limits of oil pools will be found further and further eastwards as greater depths are attained. Deep test wells are being put down to prove this.

The place of Yenangyaung is being steadily taken by the Singu field, which will soon usurp the premier position so far held by the older field. Singu, the greater part of which is in the hands of the Burmah Oil Company, is used to make good the deficiencies of Yenangyaung, in order to maintain supplies to the refinery. In 1927 Singu produced nearly 3 million gallons more than it did in 1926, but this was not enough to counterbalance the decrease in the older field. Many wells are producing from the 3,000-foot sand and initial yields of 500 barrels and over are not uncommon. Progress in the electrification of the Singu field has been made by the completion of the transmission line from Yenangyaung.

Yenangyat field has now reduced itself to the status of the Upper Chindwin field and is out-classed by Minbu. Some deep tests are

now being sunk in this field in the hope of reviving production. A scheme by which the sandbank stretching southwards from the wells at Lanywa into the river Irrawaddy is to be protected by a revetted embankment is being carried out and has enabled a number of wells to be drilled by the Indo-Burma Petroleum Company on the sand-bank. Strictly speaking, the area belongs to the Singu dome area, but for convenience of administration it will be looked upon officially as part of the Yenangyat field.

Of the other Burma fields Thayetmyo shows a small recovery instead of a decline, as also does the Upper Chindwin. The increase in Upper Chindwin took place in spite of serious interference with operations due to phenomenal floods. The production from Minbu increased by 666,530 gallons, while the Arakan fields maintain their usual small output.

In Assam in the Surma valley the Badarpur field again showed a decrease in output by over 1 million gallons. This decrease is due to partial exhaustion of the proved sands and also to less drilling. There was a small initial production from Masimpur, also in the Surma valley. In Upper Assam, on the other hand, the Digboi field showed an increase in production, amounting to nearly $1\frac{1}{4}$ million gallons. Extensions to the refinery have been put in hand, and when these are complete, a large increase in output from this field may be anticipated. The results of the prospecting operations of the Assam Oil Company at Dhekiajuli, Dilli and Burragolai have been very disappointing, and although oil was obtained in the Burragolai well, the quantity was not sufficient to be of commercial value.

In the Punjab the production was more satisfactory than for some years, for the output from the Khaur field rose by nearly $4\frac{1}{2}$ million gallons during 1927.

There was a marked rise in the imports of kerosene due to small increases in supplies from the United States, the Straits Settlements (including Labuan), and Borneo, reinforced by $12\frac{1}{2}$ million gallons from Georgia and Russia, from which the imports in 1926 were *nil*.

The quantity of fuel oil imported into India during 1926 was, as Table 24 will show, nearly 6 million gallons more than that received during the previous year, the total imports reaching 100 million gallons. Over three-quarters of the supply was derived from Persia, and the greater part of the rest from Borneo.

The export of paraffin wax increased to the extent of some 7,000 tons during 1927 (*see* Table 25).

TABLE 22.—*Quantity and value of Petroleum produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13 4).		Quantity.	Value (£1 = Rs. 13 4).	
	Gals.	Rs.	£	Gals.	Rs.	£
<i>Assam—</i>						
Badarpur . . .	3,210,838	6,77,068	50,527	1,912,593	4,98,937	37,234
Digboi . . .	20,887,697	35,68,314	266,292	22,604,187	38,59,866	288,050
Masimpur . . .	..	..	..	25,485	6,648	496
<i>Burma—</i>						
Akyab . . .	6,331	2,191	164	5,627	1,948	145
Kyaukpyu . . .	15,103	15,946	1,190	15,452	15,687	1,171
Minbu . . .	4,533,420	10,15,297	75,769	5,199,950	11,10,406	82,866
Singu . . .	95,745,504	3,59,04,564	2,679,445	98,691,437	2,09,71,930	1,565,069
Thayetmyo . . .	974,620	2,18,274	16,289	999,500	2,12,394	15,850
Upper Chindwin . . .	1,255,840	94,188	7,029	1,825,120	1,36,884	10,215
Yenangyat . . .	1,778,041	3,39,865	25,363	1,844,946	3,84,359	28,685
Yenangyaung . . .	145,731,612	5,45,00,540	4,067,204	137,322,012	2,93,81,716	2,192,665
<i>Punjab—</i>						
Attock . . .	6,230,320	15,57,580	116,237	10,667,600	26,66,900	199,022
Total . . .	280,369,326	9,78,93,827	7,305,509	281,113,909	5,92,47,675	4,421,468

TABLE 23.—*Imports of Kerosene Oil into India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13 4).		Quantity.	Value (£1 = Rs. 13 4).	
	Gals.	Rs.	£	Gals.	Rs.	£
<i>From—</i>						
Borneo . . .	6,291,079	36,66,380	273,611	7,734,388	40,11,512	299,367
Georgia . . .	..	..	..	10,248,988	59,83,067	446,871
Russia . . .	..	..	..	2,329,308	16,74,189	124,989
Straits Settlements (Including Labuan).	3,726,437	22,27,811	166,254	5,294,469	23,05,617	172,061
Sumatra . . .	915,971	6,37,814	47,598	13,000	13,338	995
United States of America.	58,325,929	3,93,34,516	2,935,412	60,250,875	4,04,81,594	3,021,015
Other countries . . .	51,820	46,401	3,463	2,287,599	9,79,932	73,129
Total . . .	69,311,233	4,59,12,931	3,426,338	88,168,827	5,54,54,249	4,133,377

TABLE 24.—Imports of Fuel Oils into India during the years 1926 and 1927.

From—	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Gals.	Rs.	£	Gals.	Rs.	£
Persia	69,844,118	1,40,50,401	1,048,587	77,872,989	1,58,09,778	1,179,834
Straits Settlements (Including Labuan).	1,525,957	4,27,245	31,884	3,615,530	11,09,027	82,768
Borneo	23,597,902	61,80,911	457,531	16,316,240	45,71,636	341,167
Other countries .	125,001	23,095	1,724	2,480,777	6,85,744	51,175
Total	1,45,97,978	2,06,31,652	1,539,676	100,265,536	2,21,76,180	1,654,939

TABLE 25.—Exports of Paraffin Wax from India during the years 1926 and 1927.

To—	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Tons.	Rs.	£	Tons.	Rs.	£
United Kingdom .	16,147	76,40,615	570,195	14,398	67,48,807	503,642
Belgium	4,810	21,88,550	163,325	5,783	26,76,485	199,738
Netherlands . .	2,645	11,92,418	88,986	3,537	16,11,254	120,243
China	2,942	15,89,289	118,604	2,897	13,91,856	103,870
Union of South Africa .	3,074	13,98,695	104,380	2,340	10,79,881	80,588
Portuguese East Africa	3,732	10,99,422	126,823	4,508	26,96,859	201,370
United States of America.	785	3,57,175	26,655	2,380	10,83,850	80,884
Australia	1,127	5,13,476	38,319	867	3,94,628	29,450
New Zealand . . .	241	1,09,655	8,183	404	2,11,574	15,789
Other countries . .	5,120	23,45,052	175,004	10,466	47,84,010	357,015
Total	40,623	1,90,34,347	1,420,474	47,700	2,26,30,704	1,692,589

Ruby, Sapphire and Spinel.

A severe decline in the output from the Mogok ruby mines of Upper Burma in 1924, followed in 1925 by a marked drop in value,

bore witness to a serious decline in the industry. The Burma Ruby Mines, Limited, ultimately decided to go into liquidation and the mines were offered for sale in September, 1926. The skeleton organisation left in charge of the mines has, however, made good use of its opportunities, with the result that the value of the output in 1926 exceeded that of the previous year by over a *lakh* of rupees. This encouraging result was effected by rigorous economy and an extension of a system of co-operation with local miners, and was assisted by some good finds of sapphires in the Kyaungdwin mine (the only one still worked by European methods).

During 1927, however, production fell in value by over 1½ lakhs of rupees, due mainly to a decrease in the value of the sapphires (and spinels) produced, there being a slight increase in the value of the rubies won.

There was a reported production in Kashmir of 1·6 cwts. in 1926 and 11 cwts. in 1927 of "corundum with sapphire patches". The value was not stated.

TABLE 26.—*Quantity and value of Ruby, Sapphire and Spinel produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Carats.	Rs.	£	Carats.	Rs.	£
Burma . . .	(a)	1,07,988 (Rubies).	8,059	(a)	1,18,000 (Rubies).	8,806
	(a)	3,41,750 (Sapphires).	25,504	(a)	1,61,500 (Sapphires).	12,052
	(a)	17,084 (Spinel).	1,271	(a)	334 (Spinel).	25
Total .		4,66,772	34,834		2,79,834	20,883

(a) Quantity not reported.

Salt.

There was a small decrease in the total output of salt amounting to 26,804 tons, all provinces and states contributing to this decrease except Madras, which showed an increase of 61,255 tons, Gwalior with a small increase, and Kashmir with a stationary output of 1 ton !

TABLE 27.—Quantity and value of Salt produced in India during the years 1926 and 1927.

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13'4).		Quantity.	Value (£1 = Rs. 13'4).	
		Tons.	Rs. £		Tons.	Rs. £
Aden	194,524	9,35,531	69,815	181,757	8,74,489	65,260
Bombay and Sind	473,127	25,33,686	189,081	432,993	23,12,426	172,569
Burma	24,409	5,60,391	41,820	19,913	5,52,196	41,209
Gwallior (a)	176	9,267	692	435	23,362	1,743
Kashmir	1	55	4	1	56	4
Madras	481,826	42,81,239	319,496	543,081	47,63,741	355,503
Northern India	464,686	28,93,350	215,922	433,765	28,53,885	212,977
Total	1,633,749	1,12,13,519	836,830	1,611,945	1,13,30,155	849,265

(a) Figures relate to official years 1926-27 and 1927-28.

The total output of rock-salt increased by 24,077 tons.

TABLE 28.—Quantity and value of Rock-salt produced in India during the years 1926 and 1927.

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13'4).		Quantity.	Value (£1 = Rs. 13'4).	
		Tons.	Rs. £		Tons.	Rs. £
Salt Range	122,895	6,26,760	46,773	145,750	8,45,720	63,113
Kohat	19,224	62,138	4,637	21,161	68,225	5,092
Mandi	4,552	1,02,549	7,653	3,837	92,112	6,874
Total	146,671	7,91,447	59,063	170,748	10,06,057	75,079

There was a considerable increase, amounting to 121,898 tons, in the imports of salt, for which the United Kingdom, Spain, Egypt and Italian East Africa were chiefly responsible. The receipts from Germany also increased, while imports from Aden showed a small decrease.

TABLE 29.—*Imports of Salt into India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
From—	Tons.	Rs.	£	Tons.	Rs.	£
United Kingdom	52,741	11,76,368	87,789	83,523	27,56,487	206,708
Germany	44,507	10,69,459	79,810	55,029	16,78,437	124,883
Spain	51,655	9,97,048	74,406	89,328	25,68,902	191,336
Aden and Dependencies	187,420	36,29,761	270,878	182,696	54,40,838	406,033
Egypt	122,232	24,90,858	185,885	148,873	42,43,591	316,686
Italian East Africa	43,926	7,90,833	59,017	63,062	17,36,872	129,617
Other countries	13,317	2,83,448	21,153	15,185	4,38,786	32,745
Total	515,798	1,04,37,770	778,938	637,698	1,88,53,913	1,407,008

Saltpetre.

Although statistics of production of saltpetre in India are no longer available, the export figures may be accepted as a fairly reliable index to the general state of the industry. Excepting a few hundreds of tons required for internal consumption as fertilizer, almost the whole of the output is exported to foreign countries. The quantity exported in 1927 amounted to 123,018 cwts. valued at Rs. 15,22,666 (£113,632) against 98,830 cwt. valued at Rs. 13,24,540 (£98,846) in 1926.

A certain amount of nitrate of potash is used for agricultural purposes on the tea gardens of India. During the War when it was impossible to obtain supplies of imported potash the amount of locally produced nitrate utilized in this way reached an appreciable figure. The practice continued and the quantities estimated to have been absorbed for fertilising purposes on tea gardens in 1923, 1924, 1925 and 1926 were 1,000, 1,100, 800 and 700 tons respectively. In 1927 this figure is estimated to have been 500 tons. The decrease during the last three years is due to the fact that it is found cheaper to employ a mixture of imported sulphate of ammonia and muriate of potash.¹

¹ From information kindly supplied by Messrs. Shaw, Wallace and Co.

TABLE 30.—*Distribution of Saltpetre exported from India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 18-4).		Quantity.	Value (£1 = Rs. 18-4).	
	Cwts.	Rs.	£	Cwts.	Rs.	£
To—						
United Kingdom .	15,038	1,80,044	13,436	13,320	1,54,074	11,498
Ceylon	61,930	7,16,452	53,467	86,410	9,42,667	70,348
Straits Settlements (including Labuan).	5,567	96,833	7,226	3,856	57,548	4,295
Hongkong . . .	11,281	2,39,440	17,869	2,050	92,300	6,888
Mauritius and Depen- dencies.	1,946	31,598	2,358	13,870	2,12,907	15,889
Other countries . .	3,068	60,173	4,490	3,512	63,170	4,714
Total .	98,880	13,24,540	98,846	123,018	15,22,666	113,632

Silver.

The production of silver from the Bawdwin mines of Upper Burma, increased from 5,103,646 ozs. valued at Rs. 88,49,722 (£660,427) in 1926 to 6,004,437 ozs. valued at Rs. 94,67,196 (£706,507) in 1927. The output of silver obtained as a bye-product from the Kolar gold mines of Mysore decreased to the extent of 2,163 ozs.

TABLE 31.—*Quantity and value of Silver produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 18-4).		Quantity.	Value (£1 = Rs. 18-4).	
	oz.	Rs.	£	oz.	Rs.	£
Burma— Northern Shan States .	5,103,646	88,49,722	660,427	6,004,437	94,67,196	706,507
Madras— Anantapur	59	94	7	149	125	9
Mysore Kolar	22,388	35,222	2,629	20,220	31,220	2,330
Total .	5,126,093	88,85,038	663,063	6,024,806	94,98,541	708,846

Tin.

In contrast to the considerable increase recorded in the previous Review there was a small decrease in the production of tin-ore in Burma from 3,548 tons valued at Rs. 61,01,858 (£455,362) in 1926 to 3,495 tons valued at Rs. 66,17,773 (£493,864) in 1927. This decrease was due to decreases in the output of Tavoy and the Southern Shan States partly balanced by a further considerable increase in the output of Mergui. Dredging and hydraulicking for tin-ore are on the increase in both the Tavoy and Mergui districts and resultant increases in the output of both districts may be anticipated. The output of mixed cassiterite-wolfram concentrates from the Mawchi mines in the Southern Shan States was 1,466 tons. The composition of these concentrates is usually 43 per cent. wolfram to 57 per cent. cassiterite, so that for the purpose of this review 836 tons have been assumed to be cassiterite and the remainder wolfram. There is no recorded output of block tin.

Imports of unwrought tin increased from 51,103 cwts. valued at Rs. 94,72,957 (£706,937) in 1926 to 60,529 cwts. valued at Rs. 1,16,72,352 (£871,071) in 1927; 98 per cent. of these imports came from the Straits Settlements. Wrought tin to the extent of 441 cwts. valued at Rs. 57,759 (£4,310) was also imported into India during the year under review.

TABLE 32.—*Quantity and value of Tin-ore produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Burma—</i>						
Mergui	703	12,86,522	96,009	1,163	26,04,760	194,385
Southern Shan States .	972	(a) 16,71,840	124,764	836	(a) 15,82,548	118,101
Tavoy	1,861	31,22,496	233,022	1,489	24,15,465	180,259
Thaon	12	21,000	1,567	7	15,000	1,119
Total .	3,548	61,01,858	455,362	3,495	66,17,773	493,864

(a) Estimated.

TABLE 33.—*Imports of unwrought Tin (blocks, ingots, bars and slabs) into India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Cwt.	Rs.	£	Cwt.	Rs.	£
From—						
United Kingdom .	1,480	2,79,824	20,882	871	1,79,418	13,389
Straits Settlements (including Labuan).	49,157	90,96,626	678,853	59,234	1,14,15,558	851,907
Other countries .	466	96,507	7,202	424	77,376	5,775
Total .	51,103	94,72,957	706,937	60,529	1,16,72,352	871,071

Tungsten.

During 1927 the output of wolfram decreased by some 324 tons to 1,160 tons, the decrease being shared by the three producing areas. Figures of export of wolfram from Burma are published annually, but from internal evidence it seems likely that they include the mixed tin-tungsten concentrates of the Southern Shan States; they are, therefore, not repeated here.

TABLE 34.—*Quantity and value of Tungsten-ore produced in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13·4).		Quantity.	Value (£1 = Rs. 13·4).	
	Tons.	Rs.	£	Tons.	Rs.	£
Burma—						
Margul	9	5,618	419	8	4,070	304
Southern Shan States .	733	(a) 3,58,999	26,791	630	(a) 3,09,330	23,084
Tavoy	742	4,06,347	30,325	522	2,56,603	19,149
Total .	1,484	7,70,964	57,535	1,160	5,70,003	42,537

(a) Estimated.

Zinc.

The production of zinc concentrates by the Burma Corporation, Ltd., in the Northern Shan States amounted to 58,286 tons valued at Rs. 73,19,468 (£546,229) in 1927 against 48,834 tons valued at Rs. 63,24,491 (£471,977) in 1926. The exports during the year under review amounted to 67,135 tons valued at Rs. 70,06,018 (£522,737) against 43,056 tons valued at Rs. 43,03,775 (£321,177) in the preceding year.

III.—MINERALS OF GROUP II.

The output, during the year under review, of alum in the Mianwali district, Punjab, amounted to 1,419 cwts. valued at Rs. 23,160 (£1,728) against 2,647 cwts. valued at Rs. 50,400 (£3,761) in 1926.

The production of amber in the Myitkyina district, Burma, rose from 39.5 cwts. valued at Rs. 21,420 (£1,599) in 1926 to 70.6 cwts. valued at Rs. 27,180 (£2,028) in 1927.

There was a further decrease in the production of apatite in the Singhbhum district, Bihar and Orissa, which amounted to 603 tons valued at Rs. 10,045 (£750) against 718 tons valued at Rs. 10,770 (£804) in 1926.

Of the total production of 67.7 tons of asbestos, valued at Rs. 13,554 (£1,011), 40 tons were produced in the Seraikela State of Bihar and Orissa, 22 tons in the Cuddapah district, Madras, and 5.7 tons in Ajmer-Merwara, Rajputana.

The output of barytes fell from 2,311 tons valued at Rs. 9,244 (£690) in 1926 to 1,719 tons valued at Rs. 9,890 (£738) in 1927. Of this 851 tons were produced from the Kurnool district of Madras and 868 tons from the Alwar State of Rajputana.

There was again a small decrease in the total production of bauxite, which fell from 4,956 tons valued at Rs. 36,768 (£2,744) in 1926 to 4,310 tons valued at Rs. 28,240 (£2,107) in 1927. Of this 3,345 tons were produced in the Kaira district of Bombay and 965 tons in Jubbulpore district of the Central Provinces.

No output of beryl was reported during the year under review.

During 1927, 48 lbs. of native bismuth valued at Rs. 128 (£10) were produced in the Tavoy district. The only previous recorded production of this metal was of 0.71 cwt. valued at Rs. 240 (£17) from the same district in 1924.

Borax is produced from the Puga valley in the Ladakh tahsil of Kashmir State. The production in 1927 was 3.6 cwts. valued at Rs. 20 (£1.5).

The total estimated value of building materials and road-metal produced in the year under consideration was Rs. 1,22,50,103 (£914,187). Certain returns supplied in cubic feet have been converted into tons on the basis of certain assumed relations between volume and weight. The total production of 3,249,378 tons of limestone and *kankar* includes the production of 59,679 tons of dolomite produced in the Gangpur State, Bihar and Orissa, mainly for use as flux in the iron and steel industry. This decreased production of dolomite in Gangpur compared with 1926 (135,424 tons) is due to the progressive replacement by limestone as a flux in the iron and steel industry.

TABLE 35.—*Production of Building Materials and*

	GRANITE AND GNEISS.		LATERITE.		LIME.		LIMESTONE AND KANKAR.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	Ra.	Tons.	Ra.	Tons	Ra.	Tons.	Ra.
Assam . . .	4,616	17,240	17,478	29,985	..	..	69,476	1,13,629
Baluchistan . .	..	..	..	..	..	..	2	180
Bengal . . .	134,125	1,65,153	..	..	..	..	..	..
Bihar and Orissa .	356,361	4,18,447	1,835	603	..	..	(a) 1,026,663	21,13,764
Bombay . . .	..	..	1,400	3,300	..	..	..	..
Burma . . .	622,756	12,20,078	262,035	4,01,633	..	..	324,042	5,75,852
Central India . .	..	..	..	..	17,457	2,00,305	128,577	96,024
Central Provinces .	..	..	..	..	..	..	474,348	6,97,150
Gwallor . . .	..	..	..	..	..	..	..	..
Kashmir . . .	..	..	..	..	132	4,450	..	..
Madras . . .	16,055	8,981	94,386	82,684	..	..	13,518	13,668
Mysore . . .	..	..	720	9,000	2,047	35,186	3,399	6,170
N.-W. F. Province .	..	..	..	..	..	..	2,073	1,959
Punjab . . .	..	..	..	..	..	..	454,669	5,95,016
Rajputana . . .	..	..	..	..	..	..	(b) 192,807	2,45,985
United Provinces .	..	..	..	..	..	..	(c) 559,804	7,24,685
Total . . .	1,133,913	16,39,799	377,354	5,27,205	19,626	2,39,941	3,249,378	51,84,082

(a) Includes 59,679 tons of dolomite.

(b) Includes 30 tons of dolomite.

(c) Include 542,128 tons of kankar used for metalling roads.

Road-metal in India during 1927.

MARBLE.		SANDSTONE.		SLATE.		TRAP.		MISCELLANEOUS.		Total value (£1 = Rs. 13-4).	
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
Tons.	Rs.	Tons.	Rs.	Tons.	Rs.	Tons.	Rs.	Tons.	Rs.	Rs.	£
..	46,084	2,25,542	3,86,306	28,836
..	180	13
..	1,65,153	12,325
..	..	18,583	20,752	1,929	36,466	3,822	5,028	312,503	3,45,558	29,40,618	219,440
..	..	6,500	11,000	..	..	26,959	1,61,274	1,086,058	7,59,947	9,35,521	69,615
..	..	110,817	1,45,807	..	..	..	..	574,546	6,11,657	29,64,927	221,263
..	..	3,714	30,200	..	..	..	..	..	..	3,26,529	24,368
..	..	538	732	..	..	..	..	49,739	41,156	7,39,038	55,152
..	..	13,824	43,870	..	..	..	..	..	..	43,870	3,274
..	93	340	..	..	18,054	22,030	26,820	2,002
..	140,067	1,38,896	2,44,229	18,226
..	16	1,400	..	..	11,845	45,645	97,401	7,269
..	1,959	146
..	5,005	1,23,827	..	..	68,932	73,228	7,92,071	59,110
5,635	1,35,264	168,269	5,20,896	230	950	..	..	38,160	50,176	9,53,271	71,139
..	..	23,803	23,654	568	7,485	..	..	463,391	8,71,296	16,32,120	121,800
5,685	1,35,264	351,948	3,01,911	7,941	1,70,468	30,781	1,66,302	2,909,379	31,85,121	1,22,50,103	914,187

There was a decrease in the recorded production of clay, which fell from 192,838 tons valued at Rs. 4,39,620 (£32,807) in 1926 to 129,177 tons valued at Rs. 2,65,572 (£19,819) in 1927.

TABLE 36.—*Production of Clays in India during 1927.*

	1927.		
	Quantity.	Value (£1 = Rs. 13·4).	
	Tons.	Rs.	£
Bengal	23,866	43,049	3,213
Bihar and Orissa	15,372	1,18,194	8,820
Burma	23,379	36,301	2,709
Central India	489	3,175	237
Central Provinces	52,446	31,775	2,371
Delhi	4,300	4,767	356
Gwalior	600	4,124	308
Kashmir	919	1,000	75
Madras	1,084	434	32
Mysore	6,003	21,168	1,580
Rajputana	709	1,585	118
Total	129,177	2,65,572	19,819

The production of sulphate of iron in Ladakh, Kashmir State, fell from 14·6 cwts. valued at Rs. 27 (£2) in 1926 to 8 cwts. valued at Rs. 15 (£1) in 1927.

The total production of corundum amounted to 65 tons valued at Rs. 8,023 (£598). Of this 13 tons were produced from the Bhandara district in the Central Provinces and 52 tons from the Salem district in Madras (See also under "Ruby, Sapphire & Spinel").

The reported production of fuller's earth fell from 3,456 tons in 1926 to 2,718 tons in 1927. Mysore is chiefly responsible for the decreased figure, but its returns are not always trustworthy owing to the illiteracy of the workers. Bikanir showed a considerable increase and Jodhpur a small decrease.

TABLE 37.—*Production of Fuller's Earth in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.		Value (£1 = Rs. 13·4.)	Quantity.		Value (£1 = Rs. 13·4.)
	Tons.	Rs.		Tons.	Rs.	£
<i>Central Provinces—</i>						
Jubbulpore . . .	..	..	..	35	173	13
Mysore . . .	1,479	3,759	281	214	539	40
<i>Rajputana—</i>						
Bikanir . . .	918	5,511	411	1,400	9,335	696
Jalsalmer . . .	21	326	24	23	345	26
Jodhpur . . .	1,038	14,005	1,045	977	12,222	912
Total .	3,456	23,601	1,761	2,718	22,614	1,687

There was a slight increase in the output of gypsum from 34,473 tons valued at Rs. 79,447 (£5,929) in 1926 to 38,105 tons valued at Rs. 89,809 (£6,702) in 1927. The effect of gypsum in small quantities upon crops—a common application is 2 maunds to the acre—is said to be remarkable, and its usefulness to the monsoon crops of South Bihar has been experimentally demonstrated.¹ The Department of Agriculture, Bihar and Orissa, is importing annually for this purpose gypsum from Jamsar in Bikanir. This experimental work may, therefore, ultimately result in a demand from agricultural districts for gypsum.

¹ D. Clouston. *Review of Agricultural Operations in India, 1924-25*, p. 52.

TABLE 38.—*Production of Gypsum in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
		Tons.	Rs. £		Tons.	Rs. £
<i>Kashmir</i> . . .	121	677	51	..	..	..
<i>Punjab—</i>						
<i>Jhelum</i> . . .	1,337	3,008	225	4,112	7,065	527
<i>Rajputana—</i>						
<i>Blkanlr</i> . . .	24,892	55,937	4,174	23,837	54,091	4,104
<i>Jalsalmer</i> . . .	123	825	61	156	1,003	75
<i>Jodhpur</i> . . .	8,000	10,000	1,418	10,000	26,750	1,996
Total .	34,478	79,447	5,929	38,105	89,809	6,702

There was a very large increase in the production of ilmenite in the Travancore State, which amounted to 17,809 tons valued at £33,443 in 1927 against 4,236·3 tons valued at £7,587 in 1926. This mineral is collected with the monazite sands and, up to a few years ago, was looked upon as a bye-product of the monazite industry. The increasing demand for the titania in the ilmenite is causing a resuscitation of the monazite industry, which had been adversely affected by the increased use of electricity for lighting purposes. (See p. 231).

There was a large increase in the production of ochre, which amounted to 3,472 tons valued at Rs. 27,477 (£2,051) against 1,872 tons valued at Rs. 30,177 (£2,252) in 1926. This increase is chiefly due to an output of 704 tons from the Jubbulpore district, Central Provinces, and of 697 tons from the Banda district, United Provinces, from both of which there was no production in the previous year.

TABLE 39.—*Production of Ochre in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
	Tons.	Rs.	£	Tons.	Rs.	£
Bihar and Orissa . . .	79	11,060	824	..	..	..
Central India . . .	(a) 806	(a) 6,301	471	760	2,822	211
Central Provinces . . .	75	1,500	112	1,026	9,532	711
Gwallior . . .	323	6,937	518	316	4,162	311
Madras . . .	275	3,750	280	350	4,750	354
Rajputana . . .	314	629	47	323	721	54
United Provinces . . .	..	..	..	607	5,489	410
Total .	1,872	30,177	2,252	3,472	27,477	2,051

(a) Revised.

Besides the production of 65 tons of corundum (see p. 248) there was an output entirely from Singhbhum of 425 tons of quartzite valued at Rs. 2,125 (£159) and of 4,425 tons of kyanite valued at Rs. 25,009 (£1,866), of which 3,665 tons were produced from the Lapso Hill mines in Khar-sawan State. The total production of quartzite and kyanite amounted to 4,850 tons valued at Rs. 27,134 (£2,025) against 1,976 tons in 1926 valued at Rs. 21,755 (£1,624).

No production of serpentine in the Skardu tahsil, Kashmir State, was recorded during the year.

The production of soda in the Ladakh tahsil, Kashmir, fell from 20 tons valued at Rs. 733 (£55) in 1926 to 11 tons valued at Rs. 400 (£30) in 1927. Salt,

consisting for the greater part of sodium carbonate, sodium bicarbonate and sodium chloride, is obtained by evaporation from the waters of the Lonar lake in the Buldana district of the Central Provinces. It is known under the general name of *trona* or *urao*, for which there is no suitable equivalent in English. The total amount of *trona* extracted in 1926 was 100 tons, the value of which was estimated at Rs. 3,000 (£224), but in 1927 there was no production, as the company working the concession has gone into liquidation. There was also a production of 1·8 tons of crude soda (*rasi*) valued at Rs. 49 (£3) in Datia State, Central India.

During 1927 there was a great fall in the total Indian output of steatite due mainly to large decreases in the reported production of Singhbhum in Bihar and Orissa and Jaipur State in Rajputana.

TABLE 40.—*Production of Steatite in India during the years 1926 and 1927.*

	1926.			1927.		
	Quantity.	Value (£1 = Rs. 13-4).		Quantity.	Value (£1 = Rs. 13-4).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Bihar and Orissa—</i>						
Mayurbhanj . . .	65-0	6,000	515	67-0	6,300	470
Seraikeila . . .	11-0	600	45	19-4	1,060	79
Santhal Parganas . .	..	..	..	110-0	1,654	123
Singhbhum . . .	2,648-0	29,742	2,220	271-0	16,839	1,257
<i>Burma—</i>						
Pakokku Hill Tracts.	17-0	5,808	433	..	..	..
<i>Central India—</i>						
Bijawar . . .	208-0	1,972	147	202-0	1,920	143
<i>Central Provinces—</i>						
Bhandara . . .	..	..	..	250-0	10,000	746
Jubbulpore . . .	800-0	16,430	1,227	870-0	10,960	818
<i>Madras—</i>						
Kurnool . . .	3-0	210	16	..	..	..
Nellore . . .	65-0	2,411	180	87-0	3,917	292
Salem . . .	480-0	12,549	936	795-0	19,438	1,461
<i>Mysore . . .</i>	80-5	243	18	68-0	204	15
<i>Rajputana—</i>						
Jaipur . . .	5,074-0	64,200	4,791	2,206-0	30,000	2,230
<i>United Provinces—</i>						
Hamirpur . . .	78-0	3,686	248	8-0	760	57
Jhansi . . .	54-0	500	37	100-0	1,680	126
Total . . .	9,678-5	1,50,260	11,213	5,068-4	1,04,732	7,816

Concurrently with large increases in the output of monazite (page 231) and ilmenite (page 250) in Travancore State in 1927, there was a large increase in the production of zircon in the same State, from 532 tons valued at £2,987 in 1926 to 1,465 tons valued at £8,129 in 1927.

Zircon.

IV.—MINERAL CONCESSIONS GRANTED.

TABLE 41.—*Statement of Mineral Concessions granted during the year 1927.*

AJMER-MERWARA.

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Ajmer .	(1) Mr. E. P. Thomas, Mining Engineer.	Mica . . .	P. L. (renewal).	8.2	12th May 1927.	1 year.
Do. .	(2) Messrs. Abdul Gani & Co., Nasirabad.	Do. . . .	P. L. .	0.3	24th June 1927.	Do.
Do. .	(3) Messrs. Radha Kishen Kanahayalal, Nasirabad.	Do. . . .	P. L. .	1.8	2nd July 1927.	Do.
Do. .	(4) Md. Sarfraz Ali, Ajmer.	Do. . . .	P. L. (renewal).	2.0	5th August 1927.	Do.
Do. .	(5) Mr. Dhiraajlal Purushatam, Nasirabad.	Do. . . .	P. L. (renewal).	1.3	8th August 1927.	Do.
Do. .	(6) Do. . . .	Do. . . .	P. L. (renewal).	1.5	Do. .	Do.
Do. .	(7) Mr. L. Chhaganlal, Nasirabad.	Do. . . .	P. L. .	2.1	24th August 1927.	Do.
Do. .	(8) Mr. Nasarwanji D. Contractor, Kalsarganj.	Mica and beryl	P. L. .	1.8	3rd September 1927.	Do.
Do. .	(9) Messrs. Abdul Ghani & Co., Nasirabad.	Mica . . .	P. L. .	2.2	12th September 1927.	Do.
Do. .	(10) Messrs. Radha Kishen Kanahayalal & Co., Nasirabad.	Do. . . .	P. L. .	1.0	20th September 1927.	Do.
Do. .	(11) Mr. L. Chhaganlal, Nasirabad.	Do. . . .	P. L. (renewal).	17.2	23rd September 1927.	Do.
Do. .	(12) Mr. L. Prem Sukh Rathl, Nasirabad.	Do. . . .	P. L. .	1.9	26th September 1927.	Do.
Do. .	(13) Mr. Dhiraajlal Purushatam, Nasirabad.	Do. . . .	P. L. (renewal).	3.1	30th September 1927.	Do.
Do. .	(14) Do. . . .	Do. . . .	P. L. .	0.4	29th September 1927.	Do.
Do. .	(15) Do. . . .	Do. . . .	P. L. .	2.4	11th October 1927.	Do.
Do. .	(16) Mr. J. K. Soneji & Co., Ajmer.	Do. . . .	M. L. .	Kalera Bogla Estate.	3rd February 1927.	7 years.
Do. .	(17) Mr. L. Chhaganlal Rau, Nasirabad.	Do. . . .	M. L. .	Para Estate .	27th August 1927.	3 years.
Beawar .	(18) The Rajputana Mineral Co., Ltd., Ajmer.	Graphite . .	P. L. (renewal).	7.3	24th August 1927.	1 year.
Do. .	(19) Do. . . .	Mica . . .	P. L. (renewal).	0.4	Do. .	Do.

P. L. = *Prospecting Licences.* M. L. = *Mining Lease.*

AJMER-MERWARA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Beawar .	(20) The Rajputana Mineral Co., Ltd., Ajmer.	Mica . . .	P. L. (renewal).	7-0	24th August 1927.	1 year.
Do. .	(21) Do. . .	Do. . . .	P. L. (renewal).	7-0	Do. .	Do.
Do. .	(22) Mr. L. Chhaganlal Sau.	Do. . . .	P. L. .	3-5	Do. .	Do.
Do. .	(23) Mr. L. Prem Sukh Rathl, Nasirabad.	Do. . . .	P. L. .	2-2	19th September 1927.	Do.

ASSAM.

Cachar .	(24) Messrs. The Burma Oil Co., Ltd.	Mineral oil .	P. L. .	4,947-2	26th September 1926.	2 years.
Do. .	(25) Do. . .	Do. . . .	P. L. .	1,088-0	3rd December 1926.	Do.
Khasi and Jaintia Hills.	(26) Messrs. D. D. Mukherjee and G. O. Mans.	Corundum and Sillimanite.	M. L. .	1,920-0	1st April 1927	30 years.
Lakhimpur	(27) Messrs. The Assam Oil Company, Ltd.	Mineral oil .	P. L. (renewal).	5,120-0	30th March 1927.	1 year.
Do. .	(28) Do. . .	Do. . . .	P. L. (renewal).	4,480-0	7th April 1927.	Do.
Do. .	(29) Do. . .	Do. . . .	P. L. (renewal).	4,160-0	20th April 1927.	Do.
Do. .	(30) Do. . .	Do. . . .	P. L. (renewal).	3,968-0	12th May 1927.	Do.
Do. .	(31) Do. . .	Do. . . .	P. L. (renewal).	853-0	23rd April 1927.	Do.
Nowgong .	(32) Messrs. The Whitehall Petroleum Corporation, Ltd.	Crude petroleum and its associated Hydro-carbon.	P. L. (renewal).	1,920-0	20th March 1927.	Do.
Do. .	(33) Do. . .	Do. . . .	P. L. (renewal).	1,344-0	Do. .	Do.
Do. .	(34) Do. . .	Do. . . .	P. L. (renewal).	1,344-0	9th April 1927.	Do.
Sadiya Frontier Tract.	(35) Messrs. The Assam Oil Co., Ltd.	Mineral oil .	P. L. .	2,240-0	19th December 1927.	Do.
Sibsagar .	(36) Do. . .	Oil and coal .	P. L. (renewal).	1,440-0	5th June 1927.	Do.
Do. .	(37) Messrs. The Burma Oil Company, Ltd.	Do. . . .	P. L. (renewal).	6,400-0	9th June 1927.	Do.
Do. .	(38) Do. . .	Oil and its associated Hydro-carbon.	P. L. (renewal).	3,488-0	26th April 1927.	2 years.

P. L.—Prospecting Licence. M. L.—Mining Lease.

BALUCHISTAN.

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Kalat .	(39) Messrs. The Burma Oil Co., Ltd.	Mineral oil . .	P. L. (renewal).	3,200	1st September 1927.	1 year.
Quetta-Pishin.	(40) Mian Mohamed Ismail of Quetta.	Coal and coal dust	M. L. .	80	10th November 1927.	30 years.
Sibi . .	(41) Messrs. The Burma Oil Co., Ltd.	Mineral oil . .	E. L. .	261,120	1st October 1927.	1 year.
Zhob . .	(42) The Baluchistan Chrome Co., Ltd., Hindubagh.	Chrome . .	M. L. .	10	10th October 1927.	30 years.
Do. .	(43) Do. . .	Do. . .	M. L. .	10	Do. .	Do.
Do. .	(44) Do. . .	Do. . .	M. L. .	10	Do. .	Do.
Do. .	(45) Do. . .	Do. . .	M. L. .	10	Do. .	Do.
Do. .	(46) Do. . .	Do. . .	M. L. .	10 .	Do. .	Do.

BENGAL.

Chittagong Hill Tracts.	(47) Messrs. The Burma Oil Co., Ltd.	Mineral oil .	P. L. (renewal).	4,313-6	15th March 1927.	1 year.
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BIHAR AND ORISSA.

Santal Parganas.	(48) Babu Binode Behari De.	Coal . . .	M. L. .	1-90	1st April 1927	2 years.
Do. .	(49) Bansiram Marwari.	Do. . .	M. L. .	8-00	Do. .	Do.
Do. .	(50) Do. . .	Do. . .	M. L. .	5-00	Do. .	Do.
Do. .	(51) Bhudhar Chandra De.	Do. . .	M. L. .	5-00	Do. .	Do.
Do. .	(52) Ramrokh Das Marwari.	Do. . .	M. L. .	2-16	Do. .	Do.
Do. .	(53) Bansiram Marwari.	Do. . .	M. L. .	1-90	Do. .	Do.
Do. .	(54) Do. . .	Do. . .	M. L. .	5-00	Do. .	Do.
Do. .	(55) Gangaram Marwari.	Do. . .	M. L. .	1-82	Do. .	Do.
Do. .	(56) Bansiram Marwari.	Do. . .	M. L. .	0-83	Do. .	Do.
Do. .	(57) Do. . .	Do. . .	M. L. .	5-04	Do. .	Do.
Do. .	(58) Bhudhar Chandra De.	Do. . .	M. L. .	3-94	Do. .	Do.
Do. .	(59) Do. . .	Do. . .	M. L. .	1-00	Do. .	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

E. L. = Exploring License.

BIHAR AND ORISSA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Santal Parganas.	(60) Binode Behari De.	Coal . . .	M. L. .	2-15	1st April 1927	2 years.
Singhbhum	(61) Satya Charan Mukherji.	Chromite . .	M. L. .	296-00	26th June 1927.	20 years.
Do.	(62) Messrs. Visanji Umarasee & Co.	Iron ore and Manganese.	P. L. .	184-70	1st March 1927.	1 year.
Do.	(63) Dwarkadas Agarwalla.	Manganese . .	P. L. .	848-00	6th May 1927.	Do.
Do.	(64) Do. . .	Do. . .	P. L. .	380-65	21st May 1927.	Do.
Do.	(65) Arjun Ladha .	Do. . .	M. L. .	138-24	18th July 1927.	10 years.
Do.	(66) Messrs. Jhina & Sons, Lalji	Iron ore . .	M. L. .	88-20	30th August 1927.	Do.
Do.	(67) Hira Lal Sarda .	Manganese and iron ore.	P. L. .	1,612-80	20th December 1927.	1 year.
Do.	(68) Do. . .	Do. . .	P. L. .	117-56	18th December 1927.	Do.

BOMBAY.

Belgaum	(69) Messrs. Dalchand Bahadur Sing.	Bauxite . .	P. L. (renewal).	1,625	14th July 1926.	3 years.
Do.	(70) Mr. A. N. Peston Jamas.	Do. . .	P. L. (renewal).	1,073	24th March 1926.	1 year.
Kanara	(71) Bapusaheb Narayan Tilve.	Manganese . .	M. L. .	10-3	27th September 1927.	25 years.
Do.	(72) Mr. T. B. Kantharia.	Do. . .	M. L. .	264	6th May 1927.	10 years.
Do.	(73) Mr. K. Ramchandra.	Do. . .	M. L. .	1,584	Do. .	Do.
Do.	(74) Mr. E. H. Rushton.	Do. . .	P. L. .	584	19th August 1927.	1 year.
Do.	(75) The Kanara Mining Syndicate.	Do. . .	P. L. .	594	1st November 1927.	Do.
Do.	(76) Do. . .	Do. . .	P. L. .	1,212	Do. .	Do.

BURMA.

Akyab	(77) Messrs. The Burma Oil Co., Ltd.	Natural petroleum (including natural gas.)	P. L. .	9,408	9th May 1927.	2 years.
Do.	(78) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. .	1,177-6	22nd April 1926.	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Akyab	(79) Messrs. The Burma Oil Co., Ltd.	Natural petroleum (including natural gas.)	P. L.	633.6	19th July 1927.	2 years.
Do.	(80) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L.	5,440	15th December 1926.	Do.
Do.	(81) Messrs. The Burma Oil Co., Ltd.	Do.	P. L.	4,051.2	19th October 1927.	Do.
Do.	(82) Mg. Sein Ban	Do.	P. L.	15.6	23rd November 1927.	Do.
Do.	(83) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	4,800	19th January 1927.	1 year.
Do.	(84) Messrs. The Burma Oil Co., Ltd.	Do.	P. L. (renewal).	1,280	2nd November 1927.	Do.
Amherst	(85) Mr. A. C. Martin	All minerals except natural petroleum.	P. L.	1,280	10th January 1927.	Do.
Do.	(86) Messrs. Talaing Tin Ltd.	Do.	P. L.	1,280	6th January 1927.	Do.
Do.	(87) Mr. L. G. Cotté	Do.	P. L.	960	9th May 1927.	Do.
Do.	(88) Saw Eu Hoke	Do.	P. L.	1,020	3rd May 1927.	Do.
Do.	(89) Mr. A. C. Jecwa	Do.	P. L.	1,280	23rd June 1927.	Do.
Do.	(90) Mr. D. A. David	Do.	P. L.	1,280	29th September 1927.	Do.
Do.	(91) Messrs. Ahmed Moosa Motiwala & Sons.	Do.	P. L.	1,120	23rd December 1927.	Do.
Do.	(92) Messrs. Hossain Hamadance and another.	Tin ore	M. L.	1,008	16th March 1927.	10 years.
Do.	(93) Messrs. Balthazar & Sons.	Oil shale	P. L. (renewal).	5,760	26th February 1927.	* 31st March 1927.
Do.	(94) Dr. M. Shawlao	Do.	P. L. (renewal).	7,040	1st February 1927.	* 30th April 1927.
Do.	(95) Saw Loin Lee	Antimony	P. L. (renewal).	1,600	1st April 1927	* 30th June 1927.
Do.	(96) Do.	Do.	P. L. (renewal).	1,235.2	Do.	Do.
Do.	(97) Messrs. Balthazar & Sons.	Oil shale	P. L. (renewal).	5,760	Do.	1 year.
Do.	(98) Mr. A. C. Martin	All minerals except oil.	P. L. (renewal).	1,280	21st July 1927.	Do.
Do.	(99) Mr. D. A. David	Do.	P. L. (renewal).	1,280	30th July 1927.	Do.

P. L. = *Prospecting License*. M. L. = *Mining Lease*.

* The period of the licenses has been extended to enable the licensees to apply for mining leases.

BURMA—*contd.*

District.	Grantee.	{Minerals }	Nature of grant.	Area in acres.	Date of commencement.	Term.
Amherst	(100) Mr. A. C. Martin	All minerals except oil.	P. L. (renewal).	640	18th October 1927.	Up to 31st March 1928.
Do.	(101) Dr. K. S. Kanga	Do.	P. L. (renewal).	550·4	6th December 1927.	1 year.
Lower Chindwin.	(102) Messrs. The Indo-Burma Petroleum Co., Ltd.	Natural petroleum (including natural gas).	P. L.	1,600	22nd September 1926.	2 years.
Do.	(103) Do.	Do.	P. L.	5,798·4	24th September 1927.	1 year.
Do.	(104) Messrs. The Burma Oil Co., Ltd.	Do.	P. L.	320	5th August 1927.	2 years.
Do.	(105) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L.	825·6	30th July 1927.	Do.
Do.	(106) Do.	Do.	P. L. (renewal).	5,760	5th July 1927.	1 year.
Do.	(107) Messrs. The Burma Oil Co., Ltd.	Do.	P. L. (renewal).	2,560	13th November 1926.	Do.
Do.	(108) Do.	Do.	P. L. (renewal).	640	24th January 1927.	Do.
Do.	(109) Lawrence Dawson.	Do.	P. L. (renewal).	1,196·8	5th February 1927.	Do.
Do.	(110) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	5,760	5th July 1927.	Do.
Do.	(111) Do.	Do.	P. L. (renewal).	5,798·4	24th September 1927.	Do.
Magwe	(112) Messrs. The Burma Oil Co., Ltd.	Do.	P. L.	320	8th December 1927.	2 years.
Do.	(113) Messrs. The Hensford Development Syndicate.	Do.	P. L. (renewal).	{ 640 640	26th November 1926. 12th June 1927.	Do.
Do.	(114) Mr. Abdul Rahaman.	Do.	P. L. (renewal).	1,280	27th July 1927.	1 year.
Do.	(115) Messrs. The British Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	70·4	26th August 1927.	Do.
Do.	(116) U. Thu Daw	Do.	P. L. (renewal).	2,560	15th October 1927.	Do.
Mergal	(117) Chan Khain Lock.	All minerals except mineral oil.	P. L.	704	13th May 1927.	Do.
Do.	(118) Joo Seng	Tin and allied minerals except mineral oil.	P. L.	486·4	22nd August 1927.	Do.
Do.	(119) Ma Tin	Do.	P. L.	716·8	15th March 1927.	Do.
Do.	(120) Messrs. Beadon and Doupe.	Do.	P. L.	576	25th April 1927.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

* Extended till the application for the mining lease over the two areas is disposed of.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergul .	(121) Mr. J. W. Newbery.	Tin . . .	P. L. .	1,203-2	31st March 1927.	1 year.
Do. .	(122) Mr. Rowland Ady.	All minerals except mineral oil.	P. L. .	3,225-6	23rd March 1927.	Do.
Do. .	(123) U. Shawe Yun .	Tin and allied minerals except mineral oil.	P. L. .	2-6	4th March 1927.	Do.
Do. .	(124) Mr. A. Herbert Noyes.	Tin and other allied metals except mineral oil.	P. L. .	88-2	21st May 1927.	Do.
Do. .	(125) Messrs. Austral Malay Tin Ltd.	Tin . . .	P. L. .	2,803-2	2nd March 1927.	Do.
Do. .	(126) Mr. R. A. Park	Do. . .	P. L. .	857-6	16th Novem- 1927.	Do.
Do. .	(127) Mr. L. R. Beale	Tin and allied minerals except mineral oil.	P. L. .	704	4th May 1927.	Do.
Do. .	(128) Ah Khpon .	All minerals except oil.	P. L. .	64	25th March 1927.	Do.
Do. .	(129) Mr. A. E. Ahmed	Tin ore and other allied metals except mineral oil.	P. L. .	486-4	22nd Feb- ruary 1927.	Do.
Do. .	(130) Mr. J. I. Milne	Tin . . .	P. L. .	19-2	31st January 1927.	Do.
Do. .	(131) Do. .	Do. . .	P. L. .	64	Do. .	Do.
Do. .	(132) Mr. G. H. Hand	Do. . .	P. L. .	1,043-2	1st March 1927.	Do.
Do. .	(133) Mr. W. R. Coleridge Beadon.	Tin and allied minerals except mineral oil.	P. L. .	377-6	29th June 1927.	Do.
Do. .	(134) Do. .	Do. . .	P. L. .	96	Do. .	Do.
Do. .	(135) Dr. John Morrow Campbell.	Tin ore and gold	P. L. .	51,200	10th January 1927.	Do.
Do. .	(136) Mr. M. A. Noor- din.	Tin and allied minerals except mineral oil.	P. L. .	883-2	22nd August 1927.	Do.
Do. .	(137) Mr. M. A. Musaji	All minerals ex- cept oil.	P. L. .	313-6	1st February 1927.	Do.
Do. .	(138) Mr. G. H. Hand	Tin . . .	P. L. .	44-8	1st March 1927.	Do.
Do. .	(139) Mr. Gul Mo- hamed.	Tin and allied minerals except mineral oil.	P. L. .	576	28th March 1927.	Do.
Do. .	(140) Mr. J. M. Forster	Do. .	P. L. .	640	22nd March 1927.	Do.
Do. .	(141) Do. .	Do. .	P. L. .	640	Do. .	Do.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
ergui .	(142) Mr. J. M. Forster.	Tin and allied minerals except mineral oil.	P. L. .	640	22nd March 1927.	1 year.
Do. .	(143) Do. . .	Do. .	P. L. .	640	Do. .	Do.
Do. .	(144) Lim Oo Gaing .	Tin and allied metals except oil.	P. L. .	204-8	3rd January 1927.	Do.
Do. .	(145) Messrs. Beadon and Doupe.	Do. .	P. L. .	403-2	3rd March 1927.	Do.
Do. .	(146) Mr. J. I. Milne .	Do. .	P. L. .	179-2	1st February 1927.	Do.
Do. .	(147) Mr. S. O. Holmes	Do. .	P. L. .	985-6	2nd June 1927.	Do.
Do. .	(148) Messrs. The Burma Finance and Mining Co., Ltd.	All minerals except oil.	P. L. .	652-8	28th June 1927.	Do.
Do. .	(149) Do. . .	Do. .	P. L. .	736	Do. .	Do.
Do. .	(150) Mr. E. B. Milne .	Do. .	P. L. .	716-8	4th June 1927.	Do.
Do. .	(151) Mr. L. R. Beale .	Tin and allied minerals.	P. L. .	883-2	4th May 1927	Do.
Do. .	(152) Dr. John Morrow Campbell.	All minerals except natural petroleum.	P. L. .	1,760	31st March 1927.	Do.
Do. .	(153) Do. . .	Do	P. L. .	2,560	31st March 1927.	Do.
Do. .	(154) Mg. E. Gyl .	Tin and allied minerals except mineral oil.	P. L. .	275-2	23rd March 1927.	Do.
Do. .	(155) Joo Seng . .	Tin and other minerals except oil.	P. L. .	1,049-6	30th November 1927.	Do.
Do. .	(156) Mr. A. H. Noyes	Tin ore and other allied metals except mineral oil.	P. L. .	153-6	31st May 1927.	Do.
Do. .	(157) Kwo Ya . .	Tin and allied minerals except mineral oil.	P. L. .	236-8	16th July 1927.	Do.
So. .	(158) Mr. G. W. Bowden.	Do. .	P. L. .	544	22nd August 1927.	Do.
Do. .	(159) Tan Po Chit .	All minerals except mineral oil.	P. L. .	371-2	4th April 1927.	Do.
Do. .	(160) Leong Foke Hye	Tin and allied minerals except oil.	P. L. .	460-8	27th August 1927.	Do.
Do. .	(161) Do. . .	Tin and allied minerals.	P. L. .	556-8	3rd May 1927	Do.
Do. .	(162) Messrs. Hand and Newbery.	Tin and allied minerals except mineral oil.	P. L. .	115-2	2nd June 1927.	Do.
Do. .	(163) En Gwan Kyin .	Tin . . .	P. L. .	812-8	22nd June 1927.	Do.

P.L. = Prospecting License. M. L. = Mining Lease.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergul	(164) Maung Po	Tin and allied minerals except mineral oil.	P. L.	332.8	21st July 1927.	1 year.
Do.	(165) Mr. A. H. Yunose	All minerals except oil.	P. L.	576	7th June 1927	Do.
Do.	(166) Messrs. Mayan Chaung Alluvials, Ltd.	Tin and allied minerals.	P. L.	1,395.2	20th July 1927.	Do.
Do.	(167) Mr. A. H. Noyes	Tin ore and other allied metals.	P. L.	204.8	21st May 1927.	Do.
Do.	(168) Tan Eik Kun	Tin and allied minerals except mineral oil.	P. L.	524.8	5th May 1927	Do.
Do.	(169) Do.	Do.	P. L.	518.4	5th April 1927.	Do.
Do.	(170) Do.	Do.	P. L.	601.6	Do.	Do.
Do.	(171) Mohamed Ismail	Do.	P. L.	857.6	7th October 1927.	Do.
Do.	(172) Maung Kyin Bu	Do.	P. L.	51.2	10th June 1927.	Do.
Do.	(173) Do.	Do.	P. L.	217.6	22nd September 1927.	Do.
Do.	(174) Messrs. Mergul Tin Dredging Co., Ltd.	Tin ore and minerals other than mineral oil.	P. L.	281.6	22nd August 1927.	Do.
Do.	(175) Mr. M. A. Musaji	Tin and allied minerals except mineral oil.	P. L.	281.6	20th July 1927.	Do.
Do.	(176) Lee Quee Chee	Tin	P. L.	627.2	22nd August 1927.	Do.
Do.	(177) Do.	Do.	P. L.	627.2	30th July 1927.	Do.
Do.	(178) Do.	Do.	P. L.	627.2	Do.	Do.
Do.	(179) Messrs. Mayan-chaung Alluvials, Ltd.	Tin and allied minerals except mineral oil.	P. L.	2,329.6	16th August 1927.	Do.
Do.	(180) Tan Eik Kun	Tin and allied minerals except mineral oil.	P. L.	160	5th May 1927	Do.
Do.	(181) Mr. M. A. Noordin.	Do.	P. L.	490.2	22nd August 1927.	Do.
Do.	(182) Mr. H. G. Hand.	Tin and allied minerals.	P. L.	780.8	8th October 1927.	Do.
Do.	(183) Messrs. Mayan-chaung Alluvials, Ltd.	Tin and allied minerals except mineral oil.	P. L.	1,792	19th September 1927.	Do.
Do.	(184) Mr. A. H. Noyes	Do.	P. L.	166.4	16th July 1927.	Do.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergui .	(185) Maung E. Gyl .	Tin and allied minerals except mineral oil.	P. L. .	480-8	23rd September 1927.	1 year.
Do. .	(186) Mr. E. B. Milne .	All minerals except mineral oil.	P. L. .	441-6	31st August 1927.	Do.
Do. .	(187) Mr. A. Herbert Noyes.	Tin ore and other allied metals except mineral oil.	P. L. .	217-6	9th September 1927.	Do.
Do. .	(188) Mr. J. W. Newbery.	Tin and allied minerals except mineral oil.	P. L. .	102-4	8th June 1927	Do.
Do. .	(189) Eng Tain Leong.	Tin . . .	P. L. .	640	30th July 1927.	Do.
Do. .	(190) Leong Ah Foo .	Tin and allied minerals except mineral oil.	P. L. .	172-8	8th December 1927.	Do.
Do. .	(191) Leong Foke Hye	Do. . .	P. L. .	486-4	8th October 1927.	Do.
Do. .	(192) Yeo Sain Guan .	Do. . .	P. L. .	1984	5th September 1927.	Do.
Do. .	(193) Mr. Kapurasingh	Tin . . .	P. L. .	844-8	23rd December 1927.	Do.
Do. .	(194) Mr. G. H. Hand.	Tin . . .	P. L. .	627-2	31st December 1927.	Do.
Do. .	(195) Yeo Sain Guan .	Tin and allied minerals except mineral oil.	P. L. .	800-0	5th September 1927.	Do.
Do. .	(196) Ah Shee . .	Tin ore . .	P. L. .	326-4	23rd December 1927.	Do.
Do. .	(197) Joo Seng . .	Do. . .	M. L. .	908-8	1st December 1927.	30 years.
Do. .	(198) Maung Po Thaik	Do. . .	M. L. .	1,580-8	16th June 1927.	Do.
Do. .	(199) In Sit Yan .	All minerals except natural petroleum and natural gas.	M. L. .	1,075-2	16th September 1927.	Do.
Do. .	(200) Tan Po Chit and Tan Sine Shin.	Tin . . .	M. L. .	582-4	1st December 1926.	Do.
Do. .	(201) Maung San Dun	Do. . .	M. L. .	128	3rd August 1926.	Do.
Do. .	(202) Messrs. The Tavyon Tin Dredging Corporation, Ltd.	All minerals except natural petroleum.	P. L. .	1,011-2	9th January 1927.	1 year.
Do. .	(203) Do. . .	Do. . .	P. L. .	723-2	8th October 1927.	Do.
Do. .	(204) Do. . .	Do. . .	P. L. .	1,260-8	9th December 1927.	Do.
Do. .	(205) Do. . .	Do. . .	P. L. .	2,214-4	8th December 1927.	Do.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergul	(206) Messrs. Tavoy Prospectors, Ltd.	All minerals except natural petroleum.	P. L.	3,033-6	23rd November 1927.	1 year.
Do.	(207) Mr. J. I. Milne	Tin ore	P. L.	556-8	10th December 1927.	Do.
Do.	(208) Tan Boon Hein	Tin and allied minerals except natural petroleum.	P. L.	454-4	1st December 1927.	Do
Do.	(209) Leong Ah Foo	Do.	P. L.	460-8	9th December 1927.	Do.
Do.	(210) Dr. Henry E. Wells.	Tin and all minerals except coal and mineral oil.	P. L. (renewal).	371-2	3rd February 1927.	Do.
Do.	(211) Do.	All minerals except coal and mineral oil.	P. L. (renewal).	320	12th April 1927.	Do.
Do.	(212) Ma Kyin Myn and Ma Lin.	Tin	P. L. (renewal).	428-8	4th May 1927	Do.
Do.	(213) Eu Guan Kyin	Do.	P. L. (renewal).	1,580-8	Do.	Do.
Do.	(214) Maung E. Gyi	Tin and allied minerals except mineral oil.	P. L. (renewal).	256	14th June 1927.	Do.
Do.	(215) Messrs. Mayanchau Alluvials, Ltd.	Tin	P. L. (renewal).	980	24th June 1927.	Do.
Do.	(216) Mr. G. H. Hand.	Do.	P. L. (renewal).	806-4	Do.	Do.
Do.	(217) Joo Seng	Tin and allied minerals except mineral oil.	P. L. (renewal).	473-6	9th August 1927.	Do.
Do.	(218) Do.	All minerals except mineral oil.	P. L. (renewal).	985-6	1st August 1927.	Do.
Do.	(219) Mr. F. L. Watts.	Tin and allied minerals except mineral oil.	P. L. (renewal).	1,196-8	9th August 1927.	Do.
Do.	(220) Do.	Do.	P. L. (renewal).	256	Do.	Do.
Do.	(221) Mr. Gul Mohamed.	Tin and allied minerals except mineral oil.	P. L. (renewal).	576	31st July 1927.	Do.
Do.	(222) Mr. M. A. Noordin.	Do.	P. L. (renewal).	250	Do.	Do.
Do.	(223) Mr. A. Aziz Yunose.	Do.	P. L. (renewal).	537-6	9th August 1927.	Do.
Do.	(224) Leong Foke Hye	Do.	P. L. (renewal).	1,202-8	23rd August 1927.	Do.
Do.	(225) Tan E. Kyin	Do.	P. L. (renewal).	121-6	27th August 1927.	Do.

P. L.—Prospecting Licence. M. L.—Mining Lease.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergui .	(226) Mr. G. H. Hand.	Tin . . .	P. L. (renewal).	2,012	4th September 1927.	1 year.
Do. .	(227) Ah Shee . .	Tin and allied minerals except oil.	P. L. (renewal).	249-6	30th October 1927.	Do.
Do. .	(228) Mr. E. Maxwell Lefroy.	Do. . .	P. L. (renewal).	684-8	Do. .	Do.
Do. .	(229) Mr. R. B. Milne .	All minerals except mineral oil.	P. L. (renewal).	1,254-4	1st December 1927.	Do.
Mektila .	(230) Mr. S. L. B. Aldworth.	All minerals and coal.	P. L. .	345-6	21st September 1927.	Do.
Minbu .	(231) Messrs. The Burma Oil Co., Ltd.	Natural petroleum (including natural gas).	M. L. .	640	1st December 1927.	30 years
Do. .	(232) Mr. L. Dhana Singh.	Natural petroleum.	P. L. (renewal).	320	10th March 1927.	1 year.
Do. .	(233) Do. . .	Do. . .	P. L. (renewal).	588-8	30th April 1927.	Do.
Myingyan .	(234) Messrs. The Burma Oil Co., Ltd.	Do. . .	P. L. .	2,809-6	22nd December 1926.	2 years.
Northern Shan States.	(235) Sawbwa of Momeik.	All minerals and precious stones.	P. L. .	268-8	15th July 1927.	1 year.
Do. .	(236) Messrs. The Burma Corporation, Ltd.	Iron ore . .	-M. L. .	172-8	1st May 1927	30 years.
Do. .	(237) Messrs. The Burma Oil Co., Ltd.	Do. . .	P. L. (renewal).	192	2nd July 1927	1 year.
Do. .	(238) Do. . .	Do. . .	P. L. (renewal).	121-6	Do. .	Do.
Pakakku .	(239) Ma Bi Bi . .	Natural petroleum	P. L. .	640	22nd November 1926.	Do.
Do. .	(240) Messrs. The Burma Oil Co., Ltd.	Do. . .	P. L. .	160	22nd March 1927.	2 years.
Do. .	(241) Do. . .	Do. . .	P. L. .	800	7th November 1926.	Do.
Do. .	(242) Mg. Myo Nyun, Agent of U. Thu Daw.	Do. . .	P. L. .	640	30th November 1927.	Do.
Do. .	(243) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. (renewal).	2,400	12th February 1927.	1 year.
Shwebo .	(244) Do. . .	Do. . .	P. L. (renewal).	5,113-6	12th March 1927.	Do.
Do. .	(245) Do. . .	Do. . .	P. L. (renewal).	5,440	14th August 1927.	Do.
Southern Shan States.	(246) Sawbwa Lawksawk. of	All minerals except oil.	P. L. .	12,000	1st November 1927.	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Southern Shan State.	(247) Mr. Colin Campbell.	All minerals except oil.	P. L.	640	15th July 1927.	1 year.
Do.	(248) Mawohi Mines .	Do. . .	P. L.	512	18th August 1927.	Do.
Do.	(249) Messrs. The Kalaw Mining Syndicate.	Do. . .	P. L. (renewal).	76.8	24th January 1926.	Do.
Do.	(250) Do. . .	Do. . .	P. L. (renewal).	4,320	27th July 1926.	Do.
Do.	(251) Messrs. Steel Bros. & Co., Ltd.	Do. . .	P. L. (renewal).	198.8	23th November 1926.	Do.
Do.	(252) Mr. Colin Campbell.	Do. . .	P. L. (renewal).	480	19th November 1926.	Do.
Do.	(253) Do. . .	Do. . .	P. L. (renewal).	480	18th December 1926.	Do.
Do.	(254) Do. . .	Do. . .	P. L. (renewal).	480	1st November 1926.	Do.
Do.	(255) Do. . .	Do. . .	P. L. (renewal).	2,240	25th November 1926.	Do.
Do.	(256) Tan Po Yin .	Do. . .	P. L. (renewal).	358.4	9th December 1926.	Do.
Do.	(257) Messrs. The Coalfields of Burma, Ltd.	Coal . . .	P. L. (renewal).	180	9th May 1926	2 years.
Do.	(258) Messrs. The Shan States Silver, Lead Co., Ltd.	All minerals except oil.	P. L. (renewal).	1,120	22nd December 1926.	1 year.
Do.	(259) Messrs. Steel Bros. & Co.	Do. . .	P. L. (renewal).	1,600	22nd February 1927.	2 years.
Do.	(260) Daw Tui & Sons	Do. . .	P. L. (renewal).	640	31st December 1926.	1 year.
Do.	(261) Tan Po Yin .	Do. . .	P. L. (renewal).	640	4th May 1927	Do.
Do.	(262) Messrs. Kalaw Mining Syndicate.	Do. . .	P. L. (renewal).	76.8	24th April 1927.	Do.
Tavoy	(263) Messrs. The Burma Finance and Mining Co., Ltd.	Tin and wolfram	M. L.	192	15th February 1927.	30 years.
Do.	(264) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Do. . .	M. L.	179.2	1st April 1927	Do.
Do.	(265) Mr. H. Kelly .	Do. . .	M. L.	880.6	16th June 1927.	Do.
Do.	(266) Mr. W. C. Toms	Tin, Wolfram and allied minerals.	M. L.	96	16th September 1927.	10 years.
Do.	(267) Quah Cheng Gwan.	Do. . .	M. L.	582.4	1st December 1926.	30 years.
Do.	(268) U. Maung.	Tin and wolfram	M. L.	422.4	1st May 1927	Do.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(269) Mr. A. S. Mahomed.	Tin and Wolfram.	P. L.	326.4	10th January 1927.	1 year.
Do.	(270) Messrs. The Tavoy Prospectors, Ltd.	Do.	P. L.	2,758.4	13th September 1927.	Do.
Do.	(271) Mr. R. C. N. Twite.	Do.	P. L.	435.2	27th January 1927.	Do.
Do.	(272) Mr. A. W. Ross.	Do.	P. L.	780.8	3rd February 1927.	Do.
Do.	(273) Messrs. The Burma Finance and Mining Co.	Do.	P. L.	64	31st January 1927.	Do.
Do.	(274) Mrs. S. Wellington.	Do.	P. L.	640	4th January 1927.	Do.
Do.	(275) Mr. J. W. Newbery.	Do.	P. L.	160	30th May 1927.	Do.
Do.	(276) Mr. J. J. A. Page	Do.	P. L.	70.4	10th March 1927.	Do.
Do.	(277) Mr. J. W. Newbery.	Do.	P. L.	230.4	30th May 1927.	Do.
Do.	(278) Quah Hun Chaung.	Do.	P. L.	275.2	3rd February 1927.	Do.
Do.	(279) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Do.	P. L.	1,036.8	7th May 1927	Do.
Do.	(280) Do.	Do.	P. L.	960	Do.	Do.
Do.	(281) U. Maung Muang.	Do.	P. L.	960	4th July 1927	Do.
Do.	(282) Mrs. S. Wellington.	Do.	P. L.	288	21st June 1927.	Do.
Do.	(283) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Do.	P. L.	2,598.4	..	Do.
Do.	(284) Mr. R. C. N. Twite.	Do.	P. L.	38.4	10th March 1927.	Do.
Do.	(285) Mr. A. W. Ross	Do.	P. L.	128	16th April 1927.	Do.
Do.	(286) Quah Cheng Guan.	Do.	P. L.	640	6th May 1927	Do.
Do.	(287) Maung Po Swe.	Do.	P. L.	326.4	4th May 1927	Do.
Do.	(288) Messrs. The Tavoy Rubber Co., Ltd.	Do.	P. L.	32	6th July 1927	Do.
Do.	(289) Mr. A. W. Ross.	Do.	P. L.	108.8	26th May 1927.	Do.
Do.	(290) Mrs. S. Wellington.	Do.	P. L.	640	13th August 1927.	Do.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(291) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Tin and wolfram.	P. L.	1,715.2	18th September 1927.	1 year.
Do.	(292) Messrs. The Burma Finance and Mining Co., Ltd.	Do.	P. L.	339.2	27th July 1927.	Do.
Do.	(293) Mr. H. Kelly.	Do.	P. L.	428.8	30th May 1927.	Do.
Do.	(294) Mr. R. C. N. Twite.	Do.	P. L.	1,996.8	1st November 1927.	Do.
Do.	(295) Chan Kee.	Do.	P. L.	755.2	15th August 1927.	Do.
Do.	(296) Messrs. The Tavoy Prospectors, Ltd.	Do.	P. L.	2,259.2	18th August 1927.	Do.
Do.	(297) Mr. W. C. Toms.	Do.	P. L.	512	22nd August 1927.	Do.
Do.	(298) Mr. M. A. Musajl.	Do.	P. L.	326.1	2nd December 1927.	Do.
Do.	(299) Khoo Sein Shan.	Do.	P. L.	640	3rd November 1927.	Do.
Do.	(300) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Do.	P. L.	1,216	..	Do.
Do.	(301) Messrs. Newbery and Ward.	Do.	P. L. (renewal).	127.6	11th October 1926.	Do.
Do.	(302) Do.	Do.	P. L. (renewal).	300.8	Do.	Do.
Do.	(303) Kim Swe.	Do.	P. L. (renewal).	396.8	31st November 1926.	Do.
Do.	(304) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	Do.	P. L. (renewal).	3,033.6	30th January 1927.	Do.
Do.	(305) Do.	Do.	P. L. (renewal).	1,196.8	27th February 1927.	Do.
Do.	(306) Quah Cheng Tock.	Do.	P. L. (renewal).	512	10th July 1927.	Do.
Do.	(307) Mr. J. J. A. Page.	Do.	P. L. (renewal).	217.6	12th July 1927.	Do.
Do.	(308) Mr. C. W. Ross.	Do.	P. L. (renewal).	1,011.2	3rd July 1927.	Do.
Do.	(309) Maung Ba Oh.	Do.	P. L. (renewal).	320	13th August 1927.	Do.
Do.	(310) Maung E. Zin.	Do.	P. L. (renewal).	723.2	20th August 1927.	Do.
Do.	(311) Maung Po Swe.	Do.	P. L. (renewal).	640	7th September 1927.	6 months.
Thahton	(312) Mr. A. Rahim.	All minerals except oil.	P. L.	2,444.8	7th February 1927.	1 year.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thahton	(813) Mr. J. M. Forsters.	All minerals except oil.	P. L.	1,548.8	7th March 1927.	1 year
Do.	(814) Mr. A. C. Martin	Do.	P. L.	2.5	20th February 1927.	Do.
Do.	(815) C. Chan Shwe	Do.	P. L.	640	14th March 1927.	Do.
Do.	(816) K. Beng Chong	Do.	P. L.	755.2	24th August 1927.	Do.
Do.	(817) Mr. A. C. Martin	Do.	P. L.	7,040	16th September 1927.	Do.
Thayetmyo.	(318) Mr. Ismail Abu Ahmed.	Natural petroleum	P. L. (renewal).	2,390	15th January 1927.	Do.
Do.	(319) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	8,960	9th February 1927.	Do.
Do.	(320) Messrs. The Indo-Burma Oilfields, Ltd.	Do.	P. L. (renewal).	634.6	2nd January 1927.	Do.
Do.	(321) Do.	Do.	P. L. (renewal).	640	29th March 1927.	Do.
Do.	(322) Do.	Do.	P. L. (renewal).	6,400	28th April 1927.	Do.
Do.	(323) Do.	Do.	P. L. (renewal).	2,560	12th July 1927.	Do.
Do.	(324) Do.	Do.	P. L. (renewal).	960	22nd July 1927.	Do.
Do.	(325) Messrs. The Burma Oil Co., Ltd.	Do.	P. L. (renewal).	2,924.8	29th November 1927.	Do.
Do.	(326) Messrs. The Indo-Burma Oilfields, Ltd.	Do.	P. L.	2,560	12th July 1926.	Do.
Do.	(327) Do.	Do.	P. L.	960	22nd July 1926.	Do.
Do.	(328) U. Kyauk Lon	Do.	P. L.	96	6th July 1927.	2 years.
Do.	(329) Mg. Tun Yan	Do.	P. L.	96	22nd November 1927.	1 year.
Toungoo	(330) Mr. J. M. Forster	All minerals except natural petroleum.	P. L.	1,280	15th February 1928.	Do.
Upper Chindwin.	(331) Messrs. The Burma Oil Co., Ltd.	Natural petroleum (including natural gas).	P. L.	8,320	..	Do.
Do.	(332) Do.	Do.	P. L. (renewal).	1,760	28th August 1927.	Do.
Do.	(333) Messrs. The Coal Fields of Burma, Ltd.	Coal	P. L. (renewal).	704	19th June 1926.	2 years.

P. L. = Prospecting License. M. L. = Mining Lease.

BURMA—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Upper Chindwin.	(334) Messrs. The Indo-Burma Petroleum Co., Ltd.	Natural petroleum (including natural gas).	P. L. (renewal).	2,580	17th March 1927.	1 year.
Do.	(335) Messrs. The Indo-Burma Oilfields, Ltd.	Do.	P. L. (renewal).	3,200	11th July 1927.	Do.
Do.	(336) Messrs. The Coal Fields of Burma, Ltd.	Coal.	P. L. (renewal).	678.4	3rd March 1927.	2 years.
Do.	(337) Do.	Do.	P. L. (renewal).	665.6	Do.	Do.
Do.	(338) Messrs. The Indo-Burma Petroleum Co., Ltd.	Natural petroleum (including natural gas).	P. L. (renewal).	640	6th October 1927.	1 year.

CENTRAL PROVINCES.

Balaghat	(339) Pandit Rewashankar.	Manganese.	M. L.	4	3rd May 1927	10 years.
Do.	(340) Mr. Chandanlal.	Do.	M. L.	250	11th December 1926.	20 years.
Do.	(341) Mr. P. N. Oke.	Do.	P. L.	59	12th January 1927.	1 year.
Do.	(342) Mr. Kanhaiyalal	Do.	P. L.	30	1st July 1927	Do.
Do.	(343) Messrs. Nosharwanji and Ardeshir Brothers.	Do.	M. L.	10	18th December 1926.	10 years.
Do.	(344) Mr. M. A. Pasha	Do.	P. L.	43	18th March 1927.	1 year.
Do.	(345) Nawab Nazrudin Khan.	Do.	P. L.	69	2nd May 1927	Do.
Do.	(346) Do.	Do.	P. L.	14	Do.	Do.
Do.	(347) Do.	Do.	P. L.	56	4th October 1927.	Do.
Do.	(348) Do.	Do.	P. L.	81	2nd May 1927	Do.
Do.	(349) Mr. Kanhaiyalal	Do.	P. L.	7	15th June 1927.	Do.
Do.	(350) Pandit Kripashankar.	Do.	M. L.	126	30th December 1926.	30 years.
Do.	(351) Ramchandra Patel and Company.	Do.	P. L.	80	12th January 1927.	1 year.
Do.	(352) Pandit Kripashankar.	Do.	M. L.	32	7th February 1927.	30 years.
Do.	(353) Seth Bhudarsao.	Do.	P. L.	17	3rd May 1927	1 year.

P. L. = *Prospecting License.* M. L. = *Mining Lease.*

CENTRAL PROVINCES—*contd.*

Distriet.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat .	(354) Mr. Kanhaiyalal	Manganese	P. L.	31	18th January 1927.	1 year.
Do. .	(355) Do. .	Do. .	P. L.	133	8th March 1927.	Do.
Do. .	(356) Do. .	Do. .	P. L.	497	Do.	Do.
Do. .	(357) Mr. Chandanlal .	Do. .	P. L.	4	8th April 1927.	Do.
Do. .	(358) Mr. C. S. Harris	Do. .	M. L.	3	14th February 1927.	30 years.
Do. .	(359) Mr. Samiulla Khan.	Do. .	P. L.	177	7th January 1924.	1 year.
Do. .	(360) Messrs. B. P. Byramji.	Do. .	M. L.	1	9th November 1927.	5 years.
Do. .	(361) Mr. Amritlal P. Trivedi.	Do. .	P. L.	52	2nd March 1927.	1 year.
Do. .	(362) Rai Bahadur Sir Bisswardas Daga.	Do. .	M. L.	77	2nd September 1927.	5 years.
Do. .	(363) Mr. Amritlal P. Trivedi.	Do. .	P. L.	10	8th March 1927.	1 year.
Do. .	(364) Nawab Nearuddin Khan.	Do. .	M. L.	12	4th July 1927	20 years.
Do. .	(365) Mr. P. N. Oke .	Do. .	P. L.	8	21st January 1927.	1 year.
Do. .	(366) Messrs. Nosharwanji and Ardenbir Brothers.	Do. .	P. L.	16	31st August 1927.	Do.
Do. .	(367) The Nagpur Manganese Mining Syndicate.	Do. .	M. L.	17	22nd July 1927.	10 years.
Do. .	(368) Mr. Chandanlal	Do. .	P. L.	44	26th September 1927.	1 year.
Do. .	(369) Mr. Amritlal P. Trivedi.	Do. .	P. L.	92	21st February 1927.	Do.
Do. .	(370) Messrs. Khoja Mitha Bhai Nathoo.	Do. .	P. L.	175	14th March 1927.	Do.
Do. .	(371) Seth Bhopat Rao.	Do. .	P. L.	279	4th July 1927	Do.
Do. .	(372) Seth Permanand Bamsidhar.	Do. .	M. L.	1	14th April 1927.	30 years.
Do. .	(373) Messrs. S. Laxman Rao and B. Narasingrao.	Do. .	P. L.	25	12th February 1927.	1 year.
Do. .	(374) Seth Shroeram .	Do. .	M. L.	35	27th June 1927.	5 years.
Do. .	(375) Mr. Amritlal P. Trivedi.	Do. .	P. L.	3	9th April 1927.	1 year.
Do. .	(376) Messrs. Khoja Mitha Bhai Nathoo.	Do. .	P. L.	26	30th July 1927.	Do.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat .	(377) The Indian Manganeese Company, Ltd.	Manganeese .	P. L. .	850	18th April 1927.	1 year.
Do. .	(378) Messrs. Ramnath Baljnath Rao Husla.	Do. . .	M. L. .	17	29th October 1927.	30 years.
Do. .	(379) The Central India Mining Company, Ltd.	Do. . .	P. L. .	806	21st June 1927.	1 year.
Do. .	(380) Mr. C. S. Harris	Limestone .	P. L. .	10	2nd May 1927.	Do.
Do. .	(381) Mr. Amritlal P. Trivedi.	Manganeese .	P. L. .	37	9th April 1927.	Do.
Do. .	(382) Messrs. B. P. Byramji and Company.	Do. . .	P. L. .	538	13th October 1927.	Do.
Do. .	(383) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	137	23th April 1927.	Do.
Do. .	(384) Thakur Nasib Singh.	Do. . .	P. L. .	350	14th May 1927.	Do.
Do. .	(385) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	30	9th April 1927.	Do.
Do. .	(386) Musst. Munna Bai.	Do. . .	P. L. .	36	16th September 1927.	Do.
Do. .	(387) Mr. Samiulla Khan.	Do. . .	P. L. .	370	20th July 1927.	Do.
Do. .	(388) Musst. Munna Bai.	Do. . .	P. L. .	156	16th September 1927.	Do.
Do. .	(389) Do. .	Do. . .	P. L. .	105	30th May 1927.	Do.
Do. .	(390) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	74	5th June 1927.	Do.
Do. .	(391) B. B. Chhajuram.	Do. . .	P. L. .	241	23rd June 1927.	Do.
Do. .	(392) Thakur Nasib Singh.	Do. . .	P. L. .	246	18th July 1927.	Do.
Do. .	(393) Mr. B. V. Buti .	Do. . .	P. L. .	197	20th July 1927.	Do.
Do. .	(394) Mr. Amritlal P. Trivedi.	Do. . .	M. L. .	35	12th September 1927.	5 years.
Do. .	(395) Musst. Munna Bai.	Do. . .	P. L. .	30	13th August 1927.	1 year.
Do. .	(396) Mr. Bhawanji Naranji.	Do. . .	P. L. .	323	21st October 1927.	Do.
Do. .	(397) Musst. Munna Bai.	Do. . .	P. L. .	132	16th September 1927.	Do.
Do. .	(398) Mr. M. B. Marfatia.	Do. . .	M. L. .	15	14th October 1927.	30 years.
Do. .	(399) Mr. Samiulla Khan.	Do. . .	P. L. .	76	26th September 1927.	1 year.

P. L.—*Prospecting License.* M. L.—*Mining Lease.*

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat .	(400) Musst. Munna Bal.	Manganesec . .	P. L. .	43	13th August 1927.	1 year.
Do. .	(401) Mr. Bhawanji Naranji.	Do. . .	P. L. .	184	12th September 1927.	Do.
Do. .	(402) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	29	21st August 1927.	Do.
Do. .	(403) Musst. Munna Bal.	Do. . .	P. L. .	74	7th July 1927.	Do.
Do. .	(404) The Central India Mining Company, Ltd.	Do. . .	P. L. .	70	22nd July 1927.	Do.
Do. .	(405) Do. .	Do. . .	P. L. .	150	Do.	Do.
Do. .	(406) Do. .	Do. . .	P. L. .	124	Do.	Do.
Do. .	(407) Do. .	Do. . .	P. L. .	301	3rd December 1927.	Do.
Do. .	(408) Nawab Neazuddin Khan.	Do. . .	P. L. .	109	6th December 1927.	Do.
Do. .	(409) Do. .	Do. . .	P. L. .	19	Do.	Do.
Do. .	(410) Mr. Mohammad Anwar Faaha.	Do. . .	P. L. .	16	7th October 1927.	Do.
Do. .	(411) Messrs. B. P. Byramji and Company.	Do. . .	P. L. .	176	1st July 1927.	Do.
Do. .	(412) Mr. Samiulla Khan.	Do. . .	P. L. .	171	24th August 1927.	Do.
Do. .	(413) Seth Ganeshlal Balbhadra.	Do. . .	P. L. .	293	9th September 1927.	Do.
Do. .	(414) Messrs. Lalbehari Ramcharan.	Do. . .	P. L. .	39	12th October 1927.	Do.
Do. .	(415) Mr. C. S. Harris	Do. . .	P. L. .	14	18th July 1927.	Do.
Do. .	(416) Mr. Amritlal P. Trivedi.	Do. . .	M. L. .	42	27th September 1927.	15 years.
Do. .	(417) Do. .	Do. . .	P. L. .	19	21st August 1927.	1 year.
Do. .	(418) Messrs. B. P. Byramji and Company.	Do. . .	P. L. .	99	4th August 1927.	Do.
Do. .	(419) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	47	6th August 1927.	Do.
Do. .	(420) Mr. Samiulla Khan.	Do. . .	P. L. .	12	27th September 1927.	Do.
Do. .	(421) Mr. Amritlal P. Trivedi.	Do. . .	P. L. .	24	21st October 1927.	Do.
Do. .	(422) Do. .	Do. . .	P. L. .	25	21st August 1927.	Do.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat	(423) Mr. P. N. Oke .	Manganese .	P. L. .	78	25th August 1927.	1 year.
Do.	(424) Mr. Kanhaiyalal	Do. .	P. L. .	27	5th November 1927.	Do.
Do.	(425) Messrs. B. P. Byramji and Company.	Do. .	M. L. .	6	24th November 1927.	5 years.
Do.	(426) Mr. Amritlal P. Trivedi.	Do. .	P. L. .	39	21st October 1927.	1 year.
Do.	(427) Mr. Abdul Rahim Khan.	Do. .	P. L. .	156	26th October 1927.	Do.
Do.	(428) Mr. Amritlal P. Trivedi.	Do. .	M. L. .	16	29th October 1927.	10 years.
Do.	(429) Do. .	Do. .	P. L. .	65	18th November 1927.	1 year.
Do.	(430) The Indian Manganese Co., Ltd.	Do. .	P. L. .	69	17th December 1927.	Do.
Do.	(431) Do. .	Do. .	P. L. .	19	5th November 1927.	Do.
Do.	(432) Pandit Kripasankar.	Do. .	M. L. .	70	22nd December 1927.	20 years.
Betul	(433) Pandit Kashiram, P. W. D. and Railway Contractor, Shahpur.	Coal .	P. L. .	634	27th June 1927.	Do.
Bhandara	(434) Nawab Nazrudin Khan.	Manganese .	P. L. .	196	23rd April 1927.	Do.
Do.	(435) Do. .	Do. .	P. L. .	85	7th May 1927.	Do.
Do.	(436) Messrs. Namdeo Pandurang Dalal and others.	Do. .	P. L. .	263	6th May 1927.	Do.
Do.	(437) Mr. Samiulla Khan.	Do. .	P. L. .	150	Extended till the execution of the mining lease. 29th March 1927.	..
Do.	(438) Mr. P. N. Oke .	Do. .	P. L. .	69	29th March 1927.	1 year.
Do.	(439) Mr. Ganchhal Balbhadra.	Do. .	P. L. .	15	16th April 1927.	Do.
Do.	(440) Mr. Sheopratap Kalschand Marwadi.	Do. .	P. L. .	84	31st October 1927.	Do.
Do.	(441) Messrs. Nilkant Rao and Company.	Do. .	P. L. .	24	24th February 1927.	Do.
Do.	(442) Mr. Suresh Chandra Das Gupta.	Do. .	P. L. .	125	6th April 1927.	Do.
Do.	(443) Messrs. Nilkant Rao and Company.	Do. .	P. L. .	38	19th April 1927.	Do.
Do.	(444) Do. .	Do. .	P. L. .	99	Do. .	Do.

P. L. = *Prospecting License.*M. L. = *Mining Lease.*

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Bhandara .	(445) Messrs. Namdeo Pandurang Dalal and others.	Manganese .	P. L. .	106	6th June 1927.	1 year.
Do. .	(446) Do. .	Do. .	P. L. .	65	6th May 1927	Do.
Do. .	(447) Do. .	Do. .	P. L. .	570	9th October 1927.	Do.
Do. .	(448) Mr. A. C. Maitra	Do. .	P. L. .	342	23rd July 1927.	Do.
Do. .	(449) Mr. M. A. Pasha	Do. .	P. L. .	8	19th April 1927.	Do.
Do. .	(450) Messrs. Ganpat-sao Dhanpatsao.	Do. .	P. L. .	40	24th June 1927.	Do.
Do. .	(451) Rai Bahadur Nritya Gopal Bose, Pleader.	Do. .	P. L. .	58	20th October 1927.	Do.
Do. .	(452) Mr. Shriram Seth.	Do. .	P. L. .	8	5th August 1927.	Do.
Do. .	(453) Rai Bahadur Nritya Gopal Bose, Pleader.	Do. .	P. L. .	176	20th October 1927.	Do.
Do. .	(454) Nawab Noazud-din Khan.	Do. .	P. L. .	16	27th September 1927.	Do.
Do. .	(455) Messrs. Ganesh-lal Balbhadra.	Do. .	P. L. .	13	13th October 1927.	Do.
Do. .	(456) Rai Sahib Gowardhandas.	Do. .	P. L. .	113	20th October 1927.	Do.
Do. .	(457) Messrs. Jadulal Bhadulal.	Do. .	P. L. .	48	10th December 1927.	Do.
Do. .	(458) Rai Sahib Gowardhandas.	Do. .	P. L. .	4	20th October 1927.	Do.
Do. .	(459) Rameshchandra Patil and Company.	Do. .	P. L. .	91	30th November 1927.	Do.
Do. .	(460) Mr. M. A. Pasha	Do. .	P. L. .	100	27th December 1927.	Do.
Do. .	(461) Messrs. Yadulal Bhadulal.	Do. .	P. L. .	1	25th December 1927.	Do.
Do. .	(462) Mr. S. Allimuddin.	Do. .	P. L. .	61	7th December 1927.	Do.
Do. .	(463) Lala Jainarayan Mohanlal.	Do. .	M. L. .	34	5th April 1927.	5 years.
Do. .	(464) Rai Sahib Seth Gowardhan Dass.	Do. .	M. L. .	7	9th February 1927.	10 years.
Do. .	(465) Messrs. Nilkant Sao and Company.	Do. .	M. L. .	18	20th April 1927.	20 years.
Do. .	(466) Messrs. Ganpat-sao Dhanpatsao.	Do. .	M. L. .	19	14th September 1927.	6 years.
Do. .	(467) Messrs. Ganesh-lal Balbhadra.	Do. .	M. L. .	19	6th October 1927.	5 years.

P. L.—Prospecting License. M. L.—Mining Lease.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Bhandara .	(468) Messrs. Nilkant Sao and Company.	Manganese .	M. L. .	27	29th July 1927.	30 years.
Do. .	(469) Mr. Shriram Seth	Do. . .	M. L. .	15	24th November 1927.	5 years.
Bilaspur .	(470) Messrs. Agarwala Brothers.	Do. . .	P. L. .	200	16th February 1927.	1 year.
Do. .	(471) Messrs. Dunlop and Considine (Ghardama Coal Fields Ltd.).	Coal and iron .	P. L. .	11,900	9th March 1927.	Do.
Do. .	(472) Do. .	Coal . . .	P. L. .	12,256	1st July 1927	Do.
Do. .	(473) Do. .	Do. . . .	P. L. .	3,376	6th November 1927.	Do.
Do. .	(474) Do. .	Do. . . .	P. L. .	4,324	30th November 1927.	Do.
Do. .	(475) Messrs. Natham Brothers.	Do. . . .	P. L. .	838	2nd December 1927.	Do.
Chhindwara	(476) Seth Laxminarayan Hasdeo.	Manganese .	P. L. .	483	7th May 1927	Do.
Do. .	(477) Mr. A. V. Wazalwar, Pleader.	Do. . . .	P. L. .	71	12th March 1927.	Do.
Do. .	(478) Mr. Noor Mohammad Mitha.	Do. . . .	P. L. .	329	6th December 1927.	Do.
Do. .	(479) Nawab Niazuddin.	Do. . . .	P. L. .	37	28th June 1927.	Do.
Do. .	(480) Messrs. Chaitram Sao and Tikaram Sao.	Do. . . .	P. L. .	315	21st June 1927.	Do.
Do. .	(481) Mr. Pratul Narain Mukerji.	Coal . . .	P. L. .	241	5th April 1927.	Do.
Do. .	(482) Mr. Hussain Khan.	Manganese .	P. L. .	275	3rd January 1927.	Do.
Do. .	(483) Mr. Saimulla Khan.	Do. . . .	P. L. .	105	12th February 1927.	Do.
Do. .	(484) Nawab Niazuddin Khan.	Do. . . .	P. L. .	88	25th July 1927.	Do.
Do. .	(485) H. S. Zahiruddin	Coal . . .	P. L. .	198	19th February 1927.	Do.
Do. .	(486) Mr. Hussain Khan.	Manganese .	P. L. .	203	17th January 1927.	Do.
Do. .	(487) Do. .	Do. . . .	P. L. .	74	Do. .	Do.
Do. .	(488) Mr. Samiulla Khan.	Do. . . .	P. L. .	222	12th February 1927.	Do.
Do. .	(489) Mr. Komalchand Jain.	Do. . . .	P. L. .	5	11th May 1927.	Do.
Do. .	(490) Messrs. Gopaldas and Nemaichand.	Do. . . .	P. L. .	242	18th May 1927.	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

CENTRAL PROVINCES—*contd.*

Distriet.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Chhindwara	(491) Messrs. Gopaldas and Nemaichand.	Manganese .	P. L. .	257	18th May 1927.	1 year.
Do.	(492) Do.	Do. .	P. L. .	106	Do. .	Do.
Do.	(493) Thakur Randhir Shah, Jagirdar.	Coal .	P. L. .	146	19th January 1927.	Do.
Do.	(494) Do.	Do. .	P. L. .	443	25th March 1927.	Do.
Do.	(495) Newton Chikhil Colliery.	Do. .	P. L. .	820	18th February 1927.	Do.
Do.	(496) Shrimant B. P. Buti.	Do. .	P. L. .	234	22nd June 1927.	Do.
Do.	(497) Mr. Hussain Khan.	Manganese .	P. L. .	59	18th May 1927.	Do.
Do.	(498) Mr. F. L. S. Simpson.	Do. .	P. L. .	517	25th March 1927.	Do.
Do.	(499) Mr. Komalchand Jain.	Do. .	P. L. .	10	11th May 1927.	Do.
Do.	(500) Mr. Hussain Khan.	Do. .	P. L. .	128	16th February 1927.	Do.
Do.	(501) Mr. R. P. Mudaliar, Proprietor of the Independent Trading Company.	Do. .	P. L. .	130	16th September 1927.	Do.
Do.	(502) Mr. Hussain Khan.	Do. .	P. L. .	54	8th August 1927.	Do.
Do.	(503) Mr. K. C. Gupta	Do. .	P. L. .	76	1st September 1927.	Do.
Do.	(504) S. Laxman Rao and B. Narsingh Rao Naidu.	Do. .	P. L. .	125	29th October 1927.	Do.
Do.	(505) Mr. Hussain Khan.	Coal .	P. L. .	580	Do. .	Do.
Do.	(506) Messrs. B. Fouzdar and Brothers.	Mica .	P. L. .	101	21st December 1927.	Do.
Drug .	(507) Nawab Niazuddin Khan.	Galena .	P. L. .	132	30th August 1927.	Do.
Do.	(508) Mr. Laxminarayan Hardeo.	Do. .	M. L. .	14	3rd November 1927.	5 years.
Jubbulpore.	(509) Mr. P. C. Dutt, Nagpur.	Manganese .	M. L. .	4	25th February 1927.	28 years.
Do.	(510) Mr. M. Venkat Ramanna, Katnl.	Do. .	P. L. .	144	31st March 1927.	1 year.
Do.	(511) Do.	Do. .	P. L. .	219	Do. .	Do.
Do.	(512) Do.	Bauxite .	P. L. .	26	25th May 1927.	Do.
Do.	(513) Mr. C. Stanley Harris, Balaghat.	Do. .	P. L. .	75	5th January 1927.	Do.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jubbulpore.	(514) M. C. Stanley Harris, Balaghat.	Bauxite . .	P. L. .	74	5th January 1927.	1 year.
Do.	(515) Pandit Chakori Lal Pathak.	Do. . .	P. L. .	3	16th March 1927.	Do.
Do.	(516) Mr. C. Stanley Harris, Balaghat.	Manganese . .	M. L. .	50	18th July 1927.	30 years.
Do.	(517) Mr. N. Venkat Ramanna, Katni.	Bauxite . .	P. L. .	228	20th July 1927.	1 year.
Nagpur	(518) Messrs. Ganpat-sao Dhanpatao.	Manganese . .	P. L. .	39	9th August 1927.	Do.
Do.	(519) Mr. M. A. Razaq	Do. . .	M. L. (Supplementary).	31	30th July 1927.	4 years.
Do.	(520) Do.	Do. . .	P. L. .	59	23rd June 1927.	1 year.
Do.	(521) Mr. Shamji Narainji.	Do. . .	P. L. .	39	3rd January 1927.	Do.
Do.	(522) Mr. Noor Mohamad Metha.	Do. . .	M. L. .	119	25th January 1927.	30 years.
Do.	(523) Seth Baghunath Das Bharuka.	Do. . .	M. L. .	41	21st January 1927.	10 years.
Do.	(524) Mr. Noor Mohamad Metha.	Do. . .	M. L. .	494	1st April 1927.	30 years.
Do.	(525) Do.	Do. . .	M. L. .	182	25th January 1927.	Do.
Do.	(526) Mr. M. A. Razaq	Do. . .	P. L. .	13	8th February 1927.	1 year.
Do.	(527) Mr. S. Vinayak Rao.	Do. . .	P. L. .	45	31st January 1927.	Do.
Do.	(528) Mr. Noor Mohamad Metha.	Do. . .	P. L. .	574	21st September 1927.	Do.
Do.	(529) Mr. M. A. Razaq	Do. . .	P. L. .	10	12th April 1927.	Do.
Do.	(530) Do.	Do. . .	P. L. .	135	19th August 1927.	Do.
Do.	(531) The Berar Mining Association.	Do. . .	P. L. .	213	19th March 1927.	Do.
Do.	(532) Mr. M. A. Razaq	Do. . .	P. L. .	129	24th June 1927.	Do.
Do.	(533) Do.	Do. . .	P. L. .	82	23rd June 1927.	Do.
Do.	(534) The Berar Mining Association.	Do. . .	P. L. .	45	19th March 1927.	Do.
Do.	(535) Do.	Do. . .	P. L. .	66	20th June 1927.	Do.
Do.	(536) Mr. L. D. Lele	Do. . .	P. L. .	308	26th July 1927.	Do.

P. L.—*Prospecting License,*M. L.—*Mining Lease.*

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(537) Mr. A. V. Wazwar.	Manganese.	P. L.	189	16th February 1927.	1 year.
Do.	(538) Mr. B. D. Vyas.	Do.	P. L.	49	4th February 1927.	Do.
Do.	(539) Seth Ramkrishna Ramnath.	Do.	P. L.	37	13th January 1927.	Do.
Do.	(540) The Berar Mining Association.	Do.	P. L.	600	4th June 1927.	Do.
Do.	(541) Mr. M. A. Razaq	Do.	P. L.	118	23rd June 1927.	Do.
Do.	(542) Mr. L. D. Lele.	Do.	P. L.	160	8th February 1927.	Do.
Do.	(543) K. S. Mohamad Yakub.	Do.	P. L.	67	22nd January 1927.	Do.
Do.	(544) Messrs. Bholanath Das and Company.	Do.	P. L.	68	20th January 1927.	Do.
Do.	(545) Sir Hari Singh Gour.	Do.	P. L.	651	4th February 1927.	Do.
Do.	(546) Mr. M. A. Razaq	Do.	P. L.	70	12th April 1927.	Do.
Do.	(547) Messrs. Bholanath Das and Company.	Do.	P. L.	42	29th January 1927.	Do.
Do.	(548) Do.	Do.	P. L.	160	1st April 1927.	Do.
Do.	(549) Mr. Bhawanji Narainji.	Do.	P. L.	123	29th March 1927.	Do.
Do.	(550) Mr. M. A. Razaq	Do.	P. L.	31	12th January 1927.	Do.
Do.	(551) Mr. Mangal Singh.	Do.	P. L.	134	13th January 1927.	Do.
Do.	(552) Seth Ramkrishna Ramnath.	Do.	P. L.	12	22nd January 1927.	Do.
Do.	(553) Messrs. Murlidhar and Rudhulal.	Do.	P. L.	100	1st February 1927.	Do.
Do.	(554) Do.	Do.	P. L.	83	Do.	Do.
Do.	(555) Mr. Bhowanji Narainji.	Do.	P. L.	98	16th September 1927.	Do.
Do.	(556) Sir Maneckjee B. Dadabhoy.	Do.	P. L.	121	29th June 1927.	Do.
Do.	(557) Mr. G. R. Totade	Do.	P. L.	157	13th April 1927.	Do.
Do.	(558) Thakur Kisan Singh.	Do.	P. L.	64	12th May 1927.	Do.
Do.	(559) Mr. Bhawanji Narainji.	Do.	P. L.	39	3rd January 1927.	Do.

P. L. = Prospecting License.

M. L. = Mining Lease.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur .	(560) Sir Maneckjee B. Dadabhoy.	Manganese .	P. L. .	37	26th April 1927.	1 year.
Do. .	(561) Messrs. The Independent Trading Co.	Do. . .	P. L. .	96	18th June 1927.	Do.
Do. .	(562) Mr. Mayal Singh	Do. . .	P. L. .	66	14th April 1927.	Do.
Do. .	(563) Do. .	Do. . .	P. L. .	218	13th April 1927.	Do.
Do. .	(564) Do. .	Do. . .	P. L. .	64	19th April 1927.	Do.
Do. .	(565) Do. .	Do. . .	P. L. .	60	8th March 1927.	Do.
Do. .	(566) Messrs. M. D. Zal & Bros.	Do. .	P. L. .	43	9th May 1927	Do.
Do. .	(567) Do. .	Do. . .	P. L. .	67	30th July 1927.	Do.
Do. .	(568) Mr. Bhawanji Narainji.	Do. .	P. L. .	31	5th March 1927.	Do.
Do. .	(569) Mr. S. C. Dass Gupta.	Do. .	P. L. .	165	29th March 1927.	Do.
Do. .	(570) Mr. N. G. Bose	Do. . .	P. L. .	26	29th January 1927.	Do.
Do. .	(571) Mr. Mangal Singh.	Do. . .	P. L. .	65	30th March 1927.	Do.
Do. .	(572) Mr. Shamji Karainji.	Do. . .	P. L. .	28	3rd January 1927.	Do.
Do. .	(573) Mr. Mangal Singh.	Do. . .	P. L. .	26	7th January 1927.	Do.
Do. .	(574) Messrs. Murlidhar and Budhulal.	Do. . .	P. L. .	228	18th August 1927.	Do.
Do. .	(575) Messrs. C. Harmooji and N. Rustumji.	Do. . .	P. L. .	253	3rd January 1927.	Do.
Do. .	(576) Do. .	Do. . .	P. L. .	41	Do. .	Do.
Do. .	(577) Do. .	Do. . .	P. L. .	115	8th April 1927.	Do.
Do. .	(578) Nawab Neazuddin Khan.	Do. . .	P. L. .	249	7th October 1927.	Do.
Do. .	(579) Mr. Mangal Singh.	Do. . .	P. L. .	62	29th July 1927.	Do.
Do. .	(580) Messrs. C. Harmooji and N. Rustumji.	Do. . .	P. L. .	38	24th March 1927.	Do.
Do. .	(581) Mr. Bhawanji Narainji.	Do. . .	P. L. .	117	14th July 1927.	Do.
Do. .	(582) Messrs. Kar & Co.	Do. . .	P. L. .	450	11th May 1927.	Do.

P. L. = Prospecting License.

M. L. = Mining Lease.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur .	(583) Messrs. C. Har-moeji and N. Rustumji.	Manganese .	P. L. .	8	8th April 1927.	1 year.
Do. .	(584) Do. .	Do. .	P. L. .	56	24th March 1927.	Do.
Do. .	(585) Do. .	Do. .	P. L. .	442	16th September 1927.	Do.
Do. .	(586) Mr. Bhawanji Narainji.	Do. .	P. L. .	56	17th October 1927.	Do.
Do. .	(587) Do. .	Do. .	P. L. .	63	15th August 1927.	Do.
Do. .	(588) Messrs. Ganpat-sao Dhanpatasao.	Do. .	P. L. .	39	19th August 1927.	Do.
Do. .	(589) Do. .	Do. .	P. L. .	10	8th March 1927.	Do.
Do. .	(590) Do. .	Do. .	P. L. .	134	Do.	Do.
Do. .	(591) Nawab Neaz-uddin Khan.	Do. .	P. L. .	37	7th October 1927.	Do.
Do. .	(592) Mr. Khoja Mithabhai Nath.	Do. .	P. L. .	35	28th July 1927.	Do.
Do. .	(593) Messrs. Noaher-wanji Ardeshir Brothers.	Do. .	M. L. .	7	15th February 1927.	30 years.
Do. .	(594) Seth Kisandayal Labhchand.	Do. .	M. L. .	50	27th October 1927.	15 years.
Do. .	(595) Mr. Syed Rasul	Do. .	M. L. .	168	4th March 1927.	30 years.
Do. .	(596) Mr. Moheshpuri	Do. .	M. L. .	37	14th February 1928.	10 years.
Do. .	(597) Mr. Shamji Nara-inji.	Do. .	M. L. .	27	31st January 1927.	15 years.
Do. .	(598) Mr. Syed Hifzul Raquib.	Do. .	M. L. .	58	16th March 1927.	Do.
Do. .	(599) Mr. S. Vinayak Rao.	Do. .	M. L. .	16	14th April 1927.	30 years.
Do. .	(600) Seth Shrikisan Hazarimal.	Do. .	M. L. .	4	23rd May 1927.	3 years.
Do. .	(601) Messrs. Namdeo Sao Dalal & Co.	Do. .	M. L. .	60	5th April 1927.	1 year.
Do. .	(602) Mr. G. R. Tolade	Do. .	M. L. .	15	10th May 1927.	5 years.
Do. .	(603) Mr. Akbar Ali .	Do. .	M. L. .	29	1st March 1927.	Do.
Do. .	(604) Mr. Moheshpuri	Do. .	M. L. .	83	14th February 1927.	10 years.
Do. .	(605) Mr. M. A. Razaq	Do. .	M. L. .	21	16th November 1927.	4 years and 14 days.

P. L. = Prospecting License.

M. L. = Mining Lease.

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(606) The Central India, Mining Co. Ltd.	Manganese .	P. L. .	160	10th October 1927.	1 year.
Do.	(607) Seth Jagannath	Do. . .	P. L. .	108	16th September 1927.	Do.
Do.	(608) Nawab Neazuddin Khan.	Do. . .	P. L. .	158	6th July 1927	Do.
Do.	(609) Mr. Shamji Narainji.	Do. . .	P. L. .	55	6th December 1927.	Do.
Do.	(610) Mr. Bhawanji Narainji.	Do. . .	P. L. .	59	17th October 1927.	Do.
Do.	(611) Mr. Shamji Narainji.	Do. . .	P. L. .	182	17th October 1927.	Do.
Do.	(612) Messrs. Ganpat-sao Dhanpatsao.	Do. . .	P. L. .	66	18th August 1927.	Do.
Do.	(613) Seth Jagannath	Do. . .	P. L. .	21	14th July 1927.	Do.
Do.	(614) Nawab Neazuddin Khan.	Do. . .	P. L. .	156	7th October 1927.	Do.
Do.	(615) Do.	Do. . .	P. L. .	113	2nd September 1927.	Do.
Do.	(616) Do.	Do. . .	P. L. .	135	22nd July 1927.	Do.
Do.	(617) Mr. Bhawanji Narainji.	Do. . .	P. L. .	55	17th October 1927.	Do.
Do.	(618) Mr. Syed Hifzul Raquib.	Do. . .	P. L. .	131	29th April 1927.	Do.
Do.	(619) Mr. Yadulal Bhodulal.	Do. . .	P. L. .	129	16th September 1927.	Do.
Do.	(620) Thakur Kisan Singh.	Do. . .	P. L. .	112	2nd August 1927.	Do.
Do.	(621) Nawab Neazuddin Khan.	Do. . .	P. L. .	123	2nd September 1927.	Do.
Do.	(622) Seth Gopaldas Nemichand.	Do. . .	P. L. .	185	17th October 1927.	Do.
Do.	(623) Mr. Mangal Singh	Do. . .	P. L. .	74	29th July 1927.	Do.
Do.	(624) Mr. Shamji Narainji.	Do. . .	P. L. .	11	17th October 1927.	Do.
Do.	(625) Mr. K. C. Gupta	Do. . .	P. L. .	532	17th June 1927.	Do.
Do.	(626) Messrs. C. Har-moeji and N. Rustumji.	Do. . .	P. L. .	56	16th September 1927.	Do.
Do.	(627) Mr. Mangal Singh	Do. . .	P. L. .	40	13th July 1927.	Do.

P. L. = *Prospecting License.* M. L. = *Mining Lease.*

CENTRAL PROVINCES—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(628) Mr. M. A. Razaq	Manganese	P. L.	227	22nd July 1927.	1 year.
Do.	(629) Mr. Mangal Singh	Do.	P. L.	116	29th April 1927.	Do.
Do.	(630) Nawab Noazuddin Khan.	Do.	P. L.	29	24th June 1927.	Do.
Do.	(631) Do.	Do.	P. L.	7	Do.	Do.
Do.	(632) Messrs. C. Har-mosji and N. Rustumji.	Do.	P. L.	111	16th September 1927.	Do.
Do.	(633) Do.	Do.	P. L.	10	15th September 1927.	Do.
Do.	(634) Mr. Mangal Singh	Do.	P. L.	100	14th October 1927.	Do.
Do.	(635) Mr. S. C. Das Gupta.	Do.	P. L.	374	15th July 1927.	Do.
Do.	(636) Mr. Mangal Singh	Do.	P. L.	237	29th July 1927.	Do.
Do.	(637) Sir Hari Singh Gour.	Do.	P. L.	319	4th November 1927.	Do.
Do.	(638) The Central India Mining Company, Ltd.	Do.	P. L.	48	18th October 1927.	Do.
Do.	(639) Mr. B. V. Buti.	Do.	P. L.	68	21st September 1927.	Do.
Do.	(640) Mr. Mangal Singh	Do.	P. L.	148	11th November 1927.	Do.
Do.	(641) Mr. Bhawanji Narainji.	Do.	P. L.	15	17th October 1927.	Do.
Do.	(642) Mr. Mangal Singh	Do.	P. L.	141	11th November 1927.	Do.
Do.	(643) Mr. K. C. Gupta	Do.	P. L.	50	28th September 1927.	Do.
Do.	(644) Mr. Mangal Singh	Do.	P. L.	37	14th July 1927.	Do.
Do.	(645) Sir M. B. Dadabhoy.	Do.	P. L.	110	5th December 1927.	Do.
Do.	(646) Messrs. C. Har-mosji and N. Rustumji.	Do.	P. L.	72	15th November 1927.	Do.
Do.	(647) Messrs. Ganpat-sao Dhanpatsao.	Do.	M. L.	19	9th November 1927.	20 years.
Do.	(648) Messrs. Shamji Narainji.	Do.	M. L. (Supplementary agreements)	1	21st April 1927.	1 year.
Do.	(649) Mr. Maheshpuri	Do.	Do.	59	9th May 1927	5 years.

P. L.—Prospecting License. M. L.—Mining Lease.

MADRAS.

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Bellary .	(650) Mr. K. A. Hye .	Manganese .	M. L. .	1,503-10	20th January 1927.	30 years.
Do.	(651) Messrs. Oomer Sait & Co.	Do. . .	P. L. .	853-51	29th July 1927.	1 year.
Do. .	(652) The Managing Director, Sree Nageswara Mining Company.	Do. . .	P. L. .	71-90	28th April 1927.	Do.
Cuddapah .	(653) Mr. B. Sitaramachari.	Asbestos .	P. L. .	184-53	9th May 1927	Do.
Do. .	(654) The Mysore Development Syndicate.	Do. . .	P. L. .	730-06	20th July 1927.	Do.
Do.	(655) Nabl Sahib .	Barytes .	P. L. .	62-08	26th August 1927.	Do.
Kurnool .	(656) Mr. V. Venkata Subayya Pantulu.	Do. . .	P. L. .	2-43	7th June 1927.	Do.
Do. .	(657) Do. .	Do. . .	P. L. .	1-65	Do. .	Do.
Do. .	(658) D. Ashroff Hussain Khan.	Do. . .	P. L. .	34-29	10th February 1927.	Do.
Do. .	(659) Do. .	Do. . .	P. L. .	61-20	24th June 1927	Do.
Do. .	(660) Mr. V. Venkatasubbayya.	Do. . .	P. L. .	1-35	21st March 1927.	Do.
Do. .	(661) D. Ashroff Hussain Khan.	Do. . .	P. L. .	24-50	26th June 1927	Do.
Do. .	(662) Mr. B. P. Sesha Reddi.	Do. . .	P. L. .	5-20	6th December 1927.	Do.
Do. .	(663) Do. .	Do. . .	P. L. .	15-22	4th October 1927.	Do.
Nellore .	(664) Mr. B. Ramalingayya Chetti.	Mica . .	M. L. .	80-50	16th December 1926.	30 years.
Do. .	(665) Mr. Bangarayya Chetti.	Do. . .	M. L. .	391-18	2nd February 1927.	Do.
Do. .	(666) Mr. M. Dasaratharam Reddi.	Do. . .	M. L. .	33-32 31-88	16th December 1926.	Do.
Do. .	(667) Mr. M. Rama Rao	Do. . .	P. L. .	4-29	31st January 1927.	1 year.
Do. .	(668) Mr. A. Pitchayya Nayudu.	Do. . .	P. L. .	117-21	Do. .	Do.
Do. .	(669) Mr. S. Venkatasubba Nayudu.	Do. . .	M. L. .	21-89	19th February 1927.	30 years.
Do. .	(670) Do. .	Do. . .	M. L. .	50-61	16th March 1927.	Do.
Do. .	(671) Mr. Pathabhiram Reddi.	Do. . .	P. L. .	102-93	4th January 1927.	1 year.
Do. .	(672) Mr. G. Venkatchalam Chetti.	Do. . .	M. L. .	9-80	25th December 1926.	30 years.

P. L. = Prospecting License. M. L. = Mining Lease.

MADRAS—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nellore .	(673) Mr. R. Ramalingam Chetti.	Mica . .	M. L. .	32-14	9th March 1927.	30 years.
Do. .	(674) Mr. T. Ramasubba Reddi.	Do. . .	P. L. .	48-68	27th May 1927	1 year.
Do. .	(675) Mr. M. Rama Rao.	Do. . .	P. L. .	38-10	19th February 1927.	Do.
Do. .	(676) Mr. M. Dasaratharam Reddi.	Do. . .	M. L. .	0-43	1st April 1927.	30 years.
Do. .	(677) Mr. C. Venkatarani Chetti.	Do. . .	P. L. .	27-73	7th January 1927.	1 year.
Do. .	(678) Mr. G. Venkatachalam Chetti.	Do. . .	P. L. .	90-02	9th March 1927.	Do.
Do. .	(679) Mr. G. Venkatachalam Chetti.	Do. . .	P. L. .	20-90	19th February 1927.	Do.
Do. .	(680) Mr. C. Pattabhiramayya.	Do. . .	M. L. .	9-63	28th July 1927.	30 years.
Do. .	(681) Mr. G. Chenchubba Reddi.	Do. . .	M. L. .	15-18	12th January 1927.	Do.
Do. .	(682) Mr. A. Rama Nayudu.	Do. . .	P. L. .	132-31	5th November 1927.	1 year.
Do. .	(683) Mr. A. Sankarappa.	Do. . .	P. L. .	5-80	6th May 1927	Do.
Do. .	(684) Mr. A. Sundaram Reddi.	Do. . .	M. L. .	44-30	28th July 1927.	30 years.
Do. .	(685) Mr. P. Chenga Reddi.	Garnet . .	P. L. .	54-79	13th December 1926.	1 year.
Do. .	(686) Mr. P. Gunnayya	Mica . .	P. L. .	4-40	16th March 1927.	Do.
Do. .	(687) Mr. M. Dasaratharam Reddi.	Do. . .	M. L. .	56-35	19th February 1927.	30 years.
Do. .	(688) Mr. P. Gunnayya Chetti.	Do. . .	M. L. .	14-51	14th July 1927.	Do.
Do. .	(689) Mr. P. Venkatasubba Reddi.	Do. . .	P. L. .	56-75	25th March 1927.	1 year.
Do. .	(690) Mr. G. Chenchubba Reddi.	Do. . .	P. L. .	12-61	30th September 1927.	Do.
Do. .	(691) Mr. Chunder Ramiah Chetti.	Do. . .	P. L. .	27-75	27th May 1927.	Do.
Do. .	(692) Mr. A. Narasimham.	Do. . .	P. L. .	1-27	18th November 1927.	Do.
Do. .	(693) Mr. P. Lakshminaras Reddi.	Do. . .	M. L. .	3-43	19th October 1927.	30 years.
Do. .	(694) Ahamed Nawaz Zang Bahadur.	Do. . .	M. L. .	25-49	26th August 1927.	Do.
Do. .	(695) Mr. K. Kadamaram Reddi.	Do. . .	P. L. .	29-56	16th September 1927.	1 year.

P. L. = Prospecting Licence. M. L. = Mining Lease.

MADRAS—*contd.*

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nellore .	(686) Mr. K. Linga Reddi.	Mica . . .	P. L. .	3-66	20th July 1927.	1 year.
Do. .	(687) Mr. I. Ramasubba Reddi.	Do. . . .	P. L. .	4-15	10th September 1927.	Do.
Do. .	(688) Mr. G. Chenchayya.	Do. . . .	P. L. .	1-45	27th September 1927.	Do.
Do. .	(689) Mr. P. Venkayya	Do. . . .	P. L. .	66-34	25th August 1927.	Do.
Do. .	(700) Do.	Do. . . .	P. L. .	78-10	Do. .	Do.
Do. .	(701) Mr. K. Kodandram Reddi.	Do. . . .	P. L. .	29-56	16th September 1927.	Do.
Salem .	(702) Mr. S. K. Ramachandar.	Magnetite and Chromite.	M. L. .	578-92	4th December 1927.	80 years.
Do. .	(703) Mr. R. Alagappa Mudaliyar.	Do. . . .	P. L. .	82-96	21st December 1927.	1 year.
Trichinopoly	(704) Middleton	Phosphate nodules	P. L. .	430-22	11th May 1927.	Do.

NORTH-WEST FRONTIER PROVINCE.

Bannu .	(705) Messrs. The Indo Burma Petroleum Company, Ltd.	Natural petroleum (including natural gas).	P. L. .	3040-0	August 1927	1 year.
Dera Ismail Khan.	(706) Do. .	Do. . . .	P. L. (Renewal)	6720-0	9th March 1927.	Do.
Do. .	(707) Do. .	Do. . . .	P. L. (Renewal)	2095-2	10th September 1927.	Do.
Do. .	(708) Messrs. The Burma Oil Company, Ltd.	Do. . . .	P. L. .	4608-0	9th May 1927	Do.
Do. .	(709) Messrs. The Indo Burma Petroleum Company, Ltd.	Do. . . .	P. L. .	150	1st September 1927.	Do.
Do. .	(710) Messrs. The Burma Oil Company, Ltd.	Do. . . .	E. L. .	6 miles wide and 3 miles either side track from Doraband to 3 miles beyond Moghalkot.	30th November 1927.	Do.

P. L. = *Prospecting License.* M. L. = *Mining Lease.* E. L. = *Exploring License.*

PUNJAB.

District.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jhelum .	(711) L. Sant Ram Kapur, B.Sc.	Coal . . .	P. L. .	144.44	3rd September 1927.	1 year.
Mianwall .	(712) Messrs. The Attock Oil Company, Ltd.	Mineral Oil .	P. L. .	500.0	15th October 1927.	2 years.
Do. .	(718) The African Construction Corporation, Ltd.	Do. . .	P. L. .	3065.6	25th January 1927.	Do.
Shahpur and Attock.	(714) Do. .	Do. . .	P. L. .	{ 3827.2 3168.0 659.2	{ 3rd January 1927.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

SUMMARY.

Province.	Exploring License.	Prospecting License.	Mining Lease.	Total of each Province.
Ajmer-Merwara		21	2	23
Assam . .		14	1	15
Baluchistan .		1	6	8
Bengal . .		1	..	1
Bihar and Orissa		5	10	21
Bombay .		5	3	8
Burma . .		248	14	262
Central Provinces		261	50	311
Madras . .		38	17	55
N. W. F. Province				6
Punjab . .				4
Total of each kind and grand total, 1927			109	714
Total for 1926			(a) 141	758

(a) Includes four quarry leases.

Classification of Licenses and Leases.

TABLE 42.—*Prospecting Licenses and Mining Leases granted in Ajmer Merwara during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Ajmer	14	45·4	Mica.
Do.	1	1·8	Mica and beryl.
Beawar	1	7·3	Graphite.
Do.	5	20·1	Mica.
TOTAL	21	..	
MINING LEASES.			
Ajmer	2	Not stated.	Mica.

TABLE 43.—*Prospecting Licenses and Mining Lease granted in Assam during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Cachar	2	6,035·2	Mineral oil.
Lakhimpur	5	18,581·0	Do.
Nowgong	3	4,608·0	Crude petroleum and its associated hydrocarbon.
Sadiya Frontier Tract	1	2,240·0	Mineral oil.
Sibsagar	2	7,840·0	Oil and coal.
Do.	1	3,488·0	Oil and its associated hydrocarbon.
TOTAL	14	..	
MINING LEASE.			
Khasi and Jaintia Hills	1	1,920·0	Corundum and sillimanite.

TABLE 44.—*Exploring and Prospecting Licenses and Mining Leases granted in Baluchistan during the year 1927.*

1927.			
DISTRICT.	No.	Area in acres.	Mineral.
EXPLORING LICENSE.			
Sibi	1	261,120	Mineral oil.
PROSPECTING LICENSE.			
Kalat	1	3,200	Mineral oil.
MINING LEASES.			
Quetta Pishin	1	80	Coal and coal dust.
Zhob	5	50	Chromite.
TOTAL	6	..	

TABLE 45.—*Prospecting License granted in Bengal during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
Chittagong Hill Tracts . . .	1	4,313·6	Mineral oil.

TABLE 46.—*Prospecting Licenses and Mining Leases granted in Bihar and Orissa during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Singhbhum	3	1,865·06	Manganese and iron ore.
Do.	2	1,228·65	Manganese.
TOTAL	5	..	

TABLE 46.—*Prospecting Licenses and Mining Leases granted in Bihar and Orissa during 1927—contd.*

DISTRICT.	1927.		
	No.	Area in acres.	Minerals.
MINING LEASES.			
Santal Parganas	13	43-24	Coal.
Singhbhum	1	296-00	Chromite.
Do.	1	133-24	Manganese.
Do.	1	82-20	Iron ore.
TOTAL	16	..	

TABLE 47.—*Prospecting Licenses and Mining Leases granted in the Bombay Presidency during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Belgaum	2	2,698	Bauxite.
Kanara	3	2,370	Manganese.
TOTAL	5	..	
MINING LEASES.			
Kanara	3	1,858-3	Manganese.

TABLE 48.—*Prospecting Licenses and Mining Leases granted in Burma during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Akyab	8	26,806-8	Natural petroleum (including natural gas).
Amherst	11	12,870-4	All minerals except natural petroleum.

TABLE 48.—*Prospecting Licenses and Mining Leases granted in Burma during 1927—contd.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES— <i>contd.</i>			
Amherst	3	18,560·0	Oil shale.
Do.	2	2,835·2	Antimony.
Lower Chindwin	10	30,259·2	Natural petroleum (including natural gas).
Magwe	5	5,510·4	Do.
Meiktila	1	345·6	All minerals and coal.
Mergui	63	34,533·6	Tin and allied minerals except mineral oil.
Do.	21	18,412·8	Tin.
Do.	19	22,804·0	All minerals except oil.
Do.	1	51,200·0	Tin and gold.
Do.	2	1,331·2	Tin and other minerals except oil.
Do.	2	691·2	Tin and all minerals except coal and mineral oil.
Minbu	2	908·8	Natural petroleum.
Myingyan	1	2,809·6	Do.
Northern Shan States	1	268·8	All minerals and precious stones.
Do.	2	313·6	Iron ore.
Pakokku	5	4,040·0	Natural petroleum.
Shwebo	2	10,553·6	Do.
Southern Shan States	10	25,862·8	All minerals except oil.
Do.	1	160·0	Coal.
Tavoy	43	32,160·0	Tin and wolfram.
Thaton	6	12,431·3	All minerals except oil.
Thayetmyo	12	29,181·4	Natural petroleum.
Toungoo	1	1,280·0	All minerals except natural petroleum.
Upper Chindwin	5	16,480·0	Natural petroleum including natural gas.
Do.	3	2,048·0	Coal.
TOTAL	248	..	

MINING LEASES.

Amherst	1	1,008·0	Tin ore.
Mergui	4	3,200·0	Do.
Do.	1	1,075·2	All minerals except natural petroleum and natural gas.

TABLE 48.—*Prospecting Licenses and Mining Leases granted in Burma during 1927—contd.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
MINING LEASES— <i>contd.</i>			
Minbu	1	640'0	Natural petroleum (including natural gas.
Northern Shan States . .	1	172'8	Iron ore.
Tavoy	4	1,683'2	Tin and wolfram.
Do.	2	678'4	Tin, wolfram and allied minerals.
TOTAL	14	..	

TABLE 49.—*Prospecting Licenses and Mining Leases granted in the Central Provinces during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Balaghat	75	8,989	Manganese.
Betul	1	634	Limestone.
Bhandara	29	2,968	Manganese.
Bilaspur	1	200	Do.
Do.	1	11,900	Coal and iron.
Do.	4	20,794	Coal.
Chhindwara	23	3,861	Manganese.
Do.	7	2,662	Coal.
Do.	1	101	Mica. ‡
Drug	1	132	Galena.
Jubbulpore	2	363	Manganese.
Do.	5	404	Bauxite.
Nagpur	111	13,252	Manganese.
TOTAL	261	..	
MINING LEASES.			
Balaghat	19	769	Manganese.
Bhandara	7	139	Do.
Drug	1	14	Galena.
Jubbulpore	2	54	Manganese.
Nagpur	21	1,521	Do.
TOTAL	50	..	

TABLE 50.—*Prospecting Licenses and Mining Leases granted in Madras during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Bellary	2	925.41	Manganese.
Cuddapah	2	914.59	Asbestos.
Do.	1	62.08	Barytes.
Kurnool	8	145.84	Do.
Nellore	22	897.47	Mica.
Do	1	54.79	Garnet.
Salem	1	82.96	Magnesianite and chromite.
Trichinopoly	1	430.22	Phosphatic nodules.
TOTAL	38	..	
MINING LEASES.			
Bellary	1	1,503.16	Manganese.
Nellore	15	820.64	Mica.
Salem	1	578.92	Magnesianite.
TOTAL	17	..	

TABLE 51.—*Prospecting and Exploring Licenses granted in the N.-W. F. Province during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
PROSPECTING LICENSES.			
Bannu	1	3,040.0	Natural petroleum including natural gas. Do.
Dera Ismail Khan	4	14,473.2	
TOTAL	5	..	
EXPLORING LICENSE.			
Dera Ismail Khan	1	Not stated.	Natural petroleum including natural gas.

TABLE 52.—*Prospecting Licenses granted in the Punjab during the year 1927.*

DISTRICT.	1927.		
	No.	Area in acres.	Mineral.
Jhelum	1	144.44	Coal.
Mianwali	2	3,565.60	Mineral oil.
Shahpur and Attock . .	1	7,654.40	Do.
TOTAL .	4	..	

NOTE ON COKING TESTS MADE WITH GONDWANA
COALS. BY CYRIL S. FOX, D.SC., M.I.MIN. E., F.G.S.,
Officiating Superintendent, Geological Survey of India.

I.—Introductory Remarks.

THE subject of India's reserves of good quality coking coal was discussed two years ago by members of the Mining and Geological Institute of India.¹ An impression was created at these meetings by some of the most experienced mining engineers that the supplies of coking coal, capable of yielding coke of metallurgical quality, were strictly limited.² Also, that, of these available reserves, by far the larger proportion was located in seams 12 to 18³ in the Jharia coal-

¹ *Trans. Min. Geol. Inst. India*, Vol. XX, 1925, pp. 118-133; 1926, pp. 331-422.

² *Op. cit.*, 1926, pp. 348-358, Mr. R. G. M. Bathgate of the East Indian Coal Company said :—" My own rough figures of the good coking coals of Jharia allowing for the known natural-coked areas give 1,100 million tons as the gross original virgin coking coal of the field. From available records it would appear that, roughly, 180 million tons of coal to date have been despatched from this field. Assuming three-fourths of this total to be first class coal, we have 135 million tons of good quality coal despatched. This figure of 135 million tons, however, is far from being the total amount of coal exploited to yield these despatches. Mr. Trecharne Rees did not overstate the case when he put the working loss at 33½ per cent. but to this latter figure must be added others bringing up a still more formidable total. Boiler consumption amounts (in 1923) to 15 per cent. on the despatch figure, or, using Trecharne Rees' figure for working losses, 10 per cent. on the gross coal. Coal for labour, theft, etc., will easily account for a further 7 per cent. on despatch figures or, say, 5 per cent. on gross. Collecting these percentages we get 33½ plus 10 plus 5=48½ per cent. But this is not all. Fires, collapses, coal locked up under railway lands, coal in barriers, etc., represent very considerable quantities of coal lost, and I consider I am placing my estimate low by saying that 50 per cent. of the coal exploited is lost in producing the coal available for despatch from collieries."

" To despatch 135 million tons of coal, therefore, means that 270 million tons have been exploited, and the total of 1,100 million tons originally is now reduced to 830 million tons. This figure of 830 million tons gross of good quality coking coal in the field will suffer all the losses calculated for the past, unless hydraulic stowing becomes the general vogue. The total amount available for despatch on present-day general practice is thus likely to be in the region of 50 per cent. of 830 million, i.e., 415 million tons." Concluding he says :—" If, however, I am out 25 per cent. or even 50 per cent. in my estimate, such error would not detract from the grave seriousness of the situation."

³ *Op. cit.*, 1926, p. 395; Dr. David Penman, Principal of the Indian School of Mines, Dhanbad, stated :—" With regard to coal of good coking quality, I find that there is a total of over 600 million tons available in 17, 15, 14A, and 14 seams down to a depth of, say, 800 feet. If 13 seam is added, the total exceeds 800 millions; and if a portion of 12 seam and a portion of 18 seam (both of which yield good coking coal) are added, the total approximates to 1,000 million tons. This figure is not greatly in excess of Mr. Bathgate's estimate of 830 million."

field.¹ It was admitted that an excellent coking coal was being worked in the Karharbari seam in the Giridih coal-field, and that the newer coal in the seams of Upper Assam about Margherita produced valuable coke. It was, however, pointed out that the Giridih lump coal was ear-marked for steam-raising purposes on the State Railways and that the slack coal was made into coke for foundry purposes in the railway workshops. The Assam coal was considered to be too far away and generally too high in sulphur to be attractive to the metallurgists of Bengal and Bihar.

The coking coal seams in Jharia belong to the lower section or the Barakar stage of the Damuda series. The same coal-bearing horizons occur in the adjacent coal-fields of Raniganj to the east-south-east and Bokaro to the west of the Jharia field. It was known that soft coke² is made in both the above mentioned coal-fields, and it was conceded that with blends of Jharia or Giridih coal with Raniganj coal metallurgical coke could be made. These opinions regarding the coking quality of the coal in the Raniganj field appear to have been largely influenced by experiments conducted in 1919 by G. C. Lathbury and G. W. Marshall.

Details of these experiments were published and circulated officially. In consequence of its limited circulation I have thought fit to give this report in full (*see* below p. 296). My purpose is to show that Messrs. Lathbury and Marshall restricted their investigations to coals largely from the upper (or Raniganj) stage of the Raniganj coal-field. As these seams cannot be correlated with the coking coal seams of the Jharia and Bokaro coal-field the above experiments cannot be considered as complete. The idea of further tests was encouraged by Sir Edwin Hall Pascoc, Director of the Geological Survey of India. In order to complete the investigation I approached Mr. H. Lancaster, Superintendent in Charge of the State Railway Collieries at Giridih. He very kindly consented to allow Mr. G. W. Marshall, who was willing, to continue the experiments. Wagon samples of coals of the lower (or Barakar) stage were sent from the Raniganj, Bokaro and Karanpura coal-fields.

I am greatly indebted to Mr. C. S. Whitworth, Chief Mining Engineer to the Railway Board, for the generous supply, free of all charges, of upwards of 100 tons of wagon samples of the various

¹ Mr. R. R. Simpson, Chief Inspector of Mines in India, had previously estimated the reserves of good quality coking coal for this field at 1,174 million tons.

² Known as 'poora koela' and containing about 8 to 10 per cent. volatiles and 25 to 30 per cent. ash.

coals necessary for the tests. Mr. H. Lancaster kindly provided all the Giridih coal for mixing purposes, free of cost. Messrs. Anderson Wright, through Mr. J. H. Thomas, forwarded the wagon load of normal Dhori slack without charge. Mr. N. Brodie of the Government Test House, Alipur, generously undertook to make drop tests on the coke samples in order to arrive at a tolerably quantitative estimate of the relative merits of the coke. Without this assistance it is quite evident that these experiments could not have been made.

II.—Report on experiments carried out at Giridih by Messrs. G. C. Lathbury and G. W. Marshall in 1919 on certain Coals for Coke-making.

‘At the request of Sir George Godfrey, Coal Controller, some experiments were carried out at Giridih to find out whether certain coals, which up to the present have been considered as non-coking, would coke when mixed with coal of good coking qualities—Giridih coal being of this latter class.

‘It was decided at first to make some laboratory experiments before making actual tests in the ovens, and for this purpose the Mining Engineer to the Railway Board picked out 20 different representative varieties of coal from the Raneegunge coal-field of which the coking qualities were known to be doubtful, very poor or non-existent.

‘Samples were received from the following collieries and the analysis of the coal is shown opposite each:—

Serial No.	Owner or Agents.	Colliery.	Seam.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.
1	Balmer Lawrie & Company.	Joyramdanga	Top or Baraboni	2.8	82.55	58.95	13.50
2	Ditto.	Ditto	Bottom	3.9	81.95	57.55	10.50
3	Bird & Company.	Charanpore	Top	4.1	82.50	55.50	12.00
4	Ditto.	Ditto	Bottom	4.1	82.20	56.35	11.45
5	Martin & Company	Ghualick	Nega	4.5	83.25	51.90	14.85

Serial No.	Owner or Agents.	Colliery.	Seam.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.
6	Martin & Company	Ghusick . .	Ghusick . .	5.1	34.05	56.15	9.80
7	Balmer Lawrie & Company.	Victoria . .	Ramnagar . .	1.8	29.30	62.50	8.20
8	Ditto .	Kenda . .	Kenda . .	5.5	38.15	52.95	13.90
9	N. C. Sircar .	Madhabpore .	Madhabpore .	6.0	35.25	53.35	11.40
10	N. M. Choudhury.	Jamehari . .	Jamehari . .	4.8	30.45	47.95	21.60
11	Andrew Yule & Company.	Sanctoria . .	Hatnal . .	2.6	31.75	53.95	14.30
12	Ditto .	Ditto .	Dishergarh . .	2.8	34.70	59.40	5.90
13	Ditto .	Ditto .	Sanctoria . .	2.6	32.55	55.25	12.20
14	Linton Molesworth	West Gunge. .	30 feet . .	1.8	29.25	59.90	10.85
15	Martin & Company	Ramnagar . .	Ramnagar (bottom)	1.6	28.55	59.15	12.30
16	N. C. Sircar .	Babisol . .	Babisol . .	7.8	33.35	52.35	14.30
17	S. Banerjee & Company.	Kajora . .	Kajora . .	5.8	34.55	52.40	13.05
18	Turnbull Bros. .	Damaguria . .	Salanpur A . .	1.4	22.10	62.10	15.80
19	P. K. Chatterjee .	East Nandi. .	Choukidanga . .	4.6	30.60	51.30	18.10
20	Bird & Company .	Hat-Gorre . .	Raghunathbutty .	3.3	31.75	48.65	19.60

NOTE.—The volatile matter, fixed carbon and ash are reckoned on the dry sample after driving off the moisture.

‘Of the above, the laboratory experiments showed that it was no use making further investigations with regard to Nos. 10, 17, 19 and 20 as these could under no circumstances be utilised for coking.

‘Many experiments were made in the laboratory by mixing with different quantities of Giridih coal and, as a result, it was possible to divide the coals up into different classes according to the quantity of Giridih coal which it was thought would be necessary to mix with them to obtain a resultant coke.

'The following coals were picked out as representing the above classes and practical experiments made in the ovens, Giridih coal being mixed in the proportion shown.

	Per cent. of Giridih coal used in mixture.
	Per cent.
1. Messrs. Balmer Lawrie and Company's Joyramdanga colliery—Bottom seam	75
2. Messrs. Bird & Company's Charanpur colliery—Top seam	75
3. Messrs. Martin & Company's Ghusick colliery—Ghusick seam	50
4. Messrs. Andrew Yule & Company's Sanctoria colliery— Hatnol seam	25
5. Messrs. Andrew Yule & Company's Sanctoria colliery— Dishergarh seam	25
6. Messrs. Linton Molesworth & Company's West Gunge colliery—30 feet seam	Nil.
7. Messrs. Martin & Company's Ramnagar colliery—Ramnagar (bottom) seam	Nil.

'The ovens in which the experiments were made are Simon Carvés' vertical flue regenerative type bye-product ovens.

'The time taken over the coking was approximately 36 hours in each case.

'The results pretty well confirmed the conclusions arrived at by the laboratory experiments.

'Samples of the coke made are sent in boxes numbered as follows and in each case 2 samples are sent marked A and B.

'A represents the better portion taken from the hottest part of the oven. B represents the remainder.

'It will be seen in each case that the higher heat produces a better quality of coke.

No. 1 Box.—Messrs. Balmer Lawrie & Company's Joyramdanga colliery—Bottom seam :—

A 20 per cent. of the charge.

B 80 per cent. of the charge.

No. 2 Box.—Messrs. Bird & Company's Charanpur colliery—Top seam :—

A 40 per cent. of the charge.

B 60 per cent. of the charge.

No. 3 Box.—Messrs. Martin & Company's Ghusick colliery—
Ghusick seam :—

A 10 per cent. of the charge.

B 90 per cent. of the charge.

No. 4 Box.—Messrs. Andrew Yule & Company's Sanctoria colliery—
Hatnol seam :—

A 10 per cent. of the charge.

B 90 per cent. of the charge.

No. 5 Box.—Messrs. Andrew Yule & Company's Sanctoria colliery—
Dishergarh seam :—

A 30 per cent. of the charge.

B 70 per cent. of the charge.

No. 6 Box.—Messrs. Linton Molesworth & Company's West
Gunge colliery—30 feet seam :—

A 40 per cent. of the charge.

B 60 per cent. of the charge.

No. 7 Box.—Messrs. Martin & Company's Ramnagar colliery—
Ramnagar (Bottom) seam :—

A 30 per cent. of the charge.

B 70 per cent. of the charge.

'As a result of our investigations we have come to the following
conclusions :—

(1) Nos. 7, 14, and 15 are good coking coals, though the quality
of coke produced from them is not quite equal to that of
the coke made from Giridih coal.

(2) Nos. 11, 12, and 13, whilst being coking coals, do not produce
a satisfactory coke. We are satisfied, however, that
a good coke can be produced by a mixture of 50 per cent.
with good coking coal.

This especially applies to No. 12 on account of the low per-
centage of ash in the coal—the result being a very much
cleaner coke. The coke made with 25 per cent. Giridih
coal and 75 per cent. Dishergarh coal only contained 14·6
per cent. of ash.

(3) The remainder are purely non-coking coals and, even when
mixed with 75 per cent. of Giridih coal, do not produce a
really 1st class coke as will be seen by an inspection of the
samples.

‘The object of the experiments was to find out whether, by mixing non-coking coals with coking ones, a good coke could be obtained and thus increase the quantity of coal available for coke making. The present sources of supplies of good coking coals are not by any means inexhaustible and if good results could have been obtained by mixing coals, then the outlook would have been much brighter.

‘The results, however, were disappointing though one cannot go so far as to say that they were a failure.

‘By mixing 25 per cent. of non-coking coal with 75 per cent. of good coking coal a coke was produced but very much inferior to the coke produced from the good coking coal by itself.

‘Unless the supplies of coking coals are seen for certain to be running very short then we think that little is to be gained by adopting the policy of mixing—though it may come to this in the future.

‘It would, we think, be a better policy to break up large coal (good coking quality) and use it for coke making instead of other purposes.

‘The coke obtained by mixing is certainly inferior and to obtain it we sacrifice a large amount of really good coke. When the non-coking coals have a high percentage of ash then it is still more undesirable to resort to mixing as not only is the resultant coke of poor quality, but it has the disadvantage of being very high in ash in addition.

‘When a non-coking coal of low ash is mixed with a good coking coal the resultant coke may not be really first class, but it has the advantage of being cleaner.’

III.—Report on Experiments carried out at Giridih by Messrs. H. Lancaster and G. W. Marshall in 1927 on Coking Coals other than Jharia.

‘Further coking tests were carried out at Giridih, with the idea of ascertaining whether or not the Indian reserves of coking coal can be increased from sources outside the Jharia and Giridih coal-fields.

‘The plants in which the experiments were carried out consist of 50 Simon Carvès vertical-flued regenerative ovens, with the necessary plant for the recovery and treatment of the bye-products. The ovens are each 33 feet long, 8 feet high and 20 inches wide,

and hold 10 tons of coal, yielding approximately 8 tons of coke on carbonization.

'The small coal received for coking is discharged into an underground hopper, from the bottom of which it is fed by a revolving table on to a 24" rubber belt, which carries it to the coal elevator.

'This elevator delivers it to the top of a ferro-concrete storage bunker, having a capacity of 1,200 tons, with housing on the top for disintegrators, which crush the coal to a fine powder.

'From the bottom of this bunker, the coal is dropped through sliding doors into an electrically-driven charging car, which travels along the top of the ovens, and is able to charge any of the ovens with its load.

'The coke is pushed out of the ovens by means of an electrically-driven ram which travels along the front of the battery.

'The gas, distilled off from the coal in the ovens, is drawn away through a 28" gas main by means of rotary steam exhausters, and is cooled by passing through a cylindrical air cooler, and a 'serpentine' water cooler. It is then passed through a tar-extracting machine, and afterwards through vertically driven mechanical 'scrubbers' where the ammonia is absorbed by means of a fine water spray.

'About 50 per cent. of the gas is then passed back to the ovens, which are heated by burning the gas in a system of vertical flues built between each oven. The surplus gas is burned in gas-fired boilers at the power station.

'As we could not arrange to put the test coals through the disintegrators, suppliers were asked to send only finely screened dust. Dhori complied best with these instructions, and the benefit of coking coal in a finely ground condition is easily noticeable in the sample of Dhori coke.

'Similarly, several of the other coke samples illustrate the bad effect on the coke of a percentage of 'unground' pieces in the coal.

'The tests were carried out at an average temperature of 900° C., giving a coking period of 32 hours, and the coal was not compressed.

'Fourteen separate tests were made as follows:—

1. Kargali.
2. Two parts Giridih with one part Dhemo Main (Dishergarh).
3. Victoria Colliery.
4. One part Giridih with one part Victoria.
5. Ramnagar.

6. Two parts Ramnagar with one part Dhemo Main.
7. One part Begunia with one part Kargali.
8. One part Begunia with one part Dhemo Main.
9. Three parts Dhemo Main with one part Damagurria.
10. Three parts Kargali with one part Argada (Karanpura).
11. Three parts Dhemo Main with one part Argada.
12. Three parts Giridih with one part Argada.
13. Dhorī.
14. Giridih.

TABLE I.

The proximate analyses of the various coals used were as follows :—

	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.
Kargali	1.40	24.85	60.55	13.20
Dhemo Main	1.10	32.45	57.35	9.10
Victoria . . . .	.95	25.95	62.90	10.20
Ramnagar	1.20	26.00	59.65	13.15
Damagurria	1.45	20.80	56.60	21.15
Begunia	1.80	27.35	65.65	15.20
Argada	1.55	29.85	51.00	17.60
Dhorī	2.10	23.95	61.70	12.25
Giridih	1.60	24.65	60.35	13.40

TABLE II.

'The proximate analyses of the coke produced in the tests were as follows :—

Serial No.	Vol. Matter.	Fixed Carbon.	Ash.	Remarks.
1	.45	82.05	17.50	Good coke. Nearly equal to Giridih.
2	.45	82.10	17.45	Fair coke. Not as good as No. 1.
3	.55	85.35	14.10	Only moderate coke.

TABLE II—*contd.*

Serial No.	Vol. Matter.	Fixed varbon.	Ash.	Remarks.
4	·40	82·65	16·95	About the average of Giridih and Victoria.
5	·40	81·50	18·10	Disappointing. Proportion of inferior coke high.
6	·45	82·75	16·80	Surprisingly good. Nearly Giridih standard.
7	·60	80·25	19·15	Nearly equal to Giridih.
8	·65	81·55	17·80	Not as good as No. 7.
9	·40	81·00	18·60	Similar to No. 8.
10	·60	79·95	19·45	'Kargali' quality spoiled.
11	·40	81·10	18·50	Almost worthless.
12	·55	79·95	19·50	Not good, but better than Nos. 10 and 11.
13	·40	83·35	16·25	Very good coke.
14	·45	80·35	19·20	

NOTE 1.—The samples were dried before analysis. In practice, they would contain between 2 per cent. and 5 per cent. moisture according to the degree of quenching.

2.—The results of the drop tests carried out at the Government Test House, Alipur, are not given in this paper as the physical tests show all the coke to be well above the standard adopted for metallurgical coke.

The Dhori coal produced an excellent coke and the Kargali coke was practically up to Giridih standard.

'The coals, however, received from Dhori and Kargali were much lower in ash content, than would have been expected, and were probably selected from a good part of the seam.

'The Argada coal proved to be a genuine 'non-coker' and from a coking point of view can be classed as hopeless.

'The Damagurria coal possesses only slight coking properties, and, being high in ash content, is unsuitable for coking purposes.

'The best 'mixing' test was No. 6, where 1 part Dishergarh mixed with 2 parts Ramnagar, produced a coke which was much superior to the coke produced from Ramnagar coal alone.

'The other tests confirmed the conclusions drawn from the experiments carried out at Giridih in 1919 (see page 296),

viz., that whilst these 'poor-coking' coals produce a serviceable coke, when mixed with good coking coal, the mechanical quality would not generally be acceptable to consumers, whilst the ordinary good supplies were available.

'There is always the possibility however, that certain 'mixtures' may produce a coke, in which the mechanical depreciation is more than counterbalanced for certain uses, by a gain in chemical composition: *e.g.*, mixing Dhemu Main coal produced a 'cleaner' (lower ash content) coke, and from the complete analyses of the samples of coke obtained in the above experiments, this possibility may be found to operate beneficially with regard to other constituents such as phosphorus and sulphur.

'The tests strikingly confirmed the knowledge that coals which produce poor coke at a carbonising temperature of say 850° C, may produce really good coke at say 1,100° C, and the present tendency of the coking industry to carbonise at higher temperatures, will undoubtedly bring into the category of 'coking coals,' many coals which have previously been considered to possess poor coking qualities.'

'It may thus be stated that the potential supplies of coking coal are now greater than was thought 10 years ago, though the extra coke produced will be more of the 'furnace' than the 'foundry' quality.'

IV.—Reserves of Coking Coal.

It is clear from the above experiments that coal capable of producing metallurgical coke is available in the Bokaro coal-field and in several of the upper seams of the Barakar stage and in the lower seams of the Raniganj stage in the western part of the Raniganj coal-field. The coals of the Karanpura coal-field cannot be considered as having been really tested. The lower section of the thick coal of Damagurria has decided coking properties, while the bottom seam (Laikdik) in Victoria colliery and the Ramnagar and Begunia seams (all in the Barakar stage of the Raniganj coal-field) were previously known to yield a tolerable coke and this has been confirmed. The Dishergarh seam (Raniganj stage) also yielded a very attractive though perhaps somewhat soft coke. It has been proved that a certain section of the thick coal at Kargali and Dhori in the Bokaro coal-field is capable of yielding a satisfactory coke. For purposes of experimental mixing I secured a typical non-coking coal from Argada

in the Karanpura coal-field. To keep a check on the behaviour of various blends it was agreed to use mixtures with Giridih coal (slack). I therefore recommended that the following charges should be used in the coke oven tests :—

- (a) Ramnagar coal slack from Ramnagar colliery.
- (b) Ramnagar with Dishergarh (Dhemo Main).
- (c) Laikdih (Victoria colliery).
- (d) Laikdih with Giridih.
- (e) Begunia with Dishergarh.
- (f) Begunia with Bokaro (Kargali).
- (g) Dishergarh with Giridih.
- (h) Dishergarh with Karanpura (Argada).
- (i) Bokaro (Kargali).
- (j) Bokaro (Kargali) with Karanpura (Argada).
- (k) Bokaro (Dhori colliery).
- (l) Giridih with Karanpura (Argada).
- (m) Giridih.

In all these cases dust, or at all events slack coal, was used. In the case of Damagurria it must be recorded that the dust represented the whole seam, whereas it is known that the lower section of the seam is much superior to the rest of the coal. In my opinion a screened sample of the dust and slack from the Damagurria lower section is well worth a trial, both alone and mixed with Dishergarh. In the case of Kargali and Dhori, particularly the latter, the slack was obtained from the upper section of the seam ; this is quite in order as this section of the seam is being separately worked. There is little doubt that the same seam should also be worked in sections in the State Railway collieries in the Bokaro field. It is, of course, known to be the custom in each of the iron-works that the coke is made from a blend of at least three and sometimes six and seven coals : e.g., The Indian Iron and Steel Co. use coking coals from the following Jharja seams :—

No. of seam.						Colliery.
13, 14 and 15	.	.	.	.	.	Gaslitan.
12, 13, 14 and 15	.	.	.	.	.	Union.
12, 13, 14 and 15	.	.	.	.	.	Sendra.
						Standard.
						Khas Jharja.
						Bhulanbararoo.
11	.	.	.	.	.	National.
11 and 12	.	.	.	.	.	Khas Angarpathra

The analysis of the coals (when mixed together) is:—

	Per cent.
Moisture	1·98
Volatile matter	25·74
Fixed carbon	62·20
Ash	11·58
Sulphur	0·50
Phosphorus	0·10

while a complete analysis of the coke produced is:—

	Per cent.
Moisture	2·58
Volatile matter	1·32
Fixed carbon	76·45
Ash	19·37
Details of ash—	
Silica	9·40
Alumina	5·59
Ferric oxide	2·44
Lime	0·89
Magnesia	0·12
Phosphoric oxide	0·41
Sulphur	0·52
	<hr/>
	19·37

I have been unable to extract a definite specification of the suitability of a coke for metallurgical purposes, especially for blast furnace coke, from a competent authority or from any of the metallurgists at the Indian iron smelting centres. They naturally demand low-ash, moderately porous hard coke, but they accept and use material far below the quality they desire.

In a paper read before the West of Scotland Iron and Steel Institute (in 1925), Mr. Edgar C. Evans is credited with saying that “the problem has yet to be solved of devising a suitable test which would give both the coke maker and the blast furnace manager an idea as to the behaviour of coke in the furnace.”

At my request Mr. H. Brodie, Superintendent-in-Charge of the Government Test House at Alipur very kindly tested samples of the coke made during the Lancaster-Marshall experiments. The test consisted in dropping 6 pieces of coke of each lot from a height of 5 feet on to a steel plate. It was arranged that if 25 per cent. of the

fragments passed through a 1-inch screen the coke should be considered useless for blast furnace purposes. In no case did small material from the drop tests amount to more than 2 or 3 per cent. So that according to this specification all the coke produced in the experiments is well above the standard required. I have therefore not considered it necessary to include Mr. Brodie's results in this paper. I think, however, that a ball mill testing machine would give a more satisfactory physical test. As regards ash percentage the greatest desideratum is uniformity. It is far more useful to have a steady 20 per cent. ash than it is to have fluctuations from 16 to 22 per cent. ash. The composition of the ash is important, but the uniformity of this composition is more important. The phosphorus percentage of Indian coals is receiving greater attention to-day than before. Detailed chemical analyses of coals from definite seams should be made by the various firms engaged from samples taken from *known* positions.

Recent analyses of Indian coals are given on the following pages.

TABLE III.—*Analyses of typical best Jharia coking coals.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moisture	1.30	1.27	1.67	1.80	1.27	1.10	1.10	1.45	1.30	1.08	1.70	2.11	1.97	1.58
Volatile matter*	24.90	21.80	23.40	30.27	22.85	19.60	20.00	26.40	23.00	18.52	26.70	28.00	27.66	23.65
Fixed carbon *	64.70	68.96	68.00	59.18	64.70	65.70	66.60	64.45	66.10	68.18	62.30	60.20	59.90	62.15
Ash*	10.40	9.24	8.60	10.55	12.45	14.70	13.40	9.15	10.90	13.30	11.00	11.80	12.44	14.20
Calorific value (calories) . .	7,885	7,941	7,731	7,335	7,457	7,237	7,528	7,670	7,690	7,176	7,517	7,344	7,598	7,558

* Moisture free basis.

1. No. 14-A seam, Standard colliery (F. W. Heiglers & Co.) ; analysis by Alipur Test House.
2. No. 14-A seam, Lodna colliery (Turner Morrison & Co.) ; analysis by Alipur Test House.
3. No. 14-A seam, Bararee colliery (Jardine, Skinner & Co.) ; analysis by Alipur Test House.
4. No. 14 seam, Bhowra colliery (Mackinnon, Mackenzie & Co.) ; analysis by Alipur Test House.
5. No. 14 seam, Bhugutdih colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
6. No. 14 seam, Gasitan colliery (Octavius Steel & Co.) ; analysis by Alipur Test House.
7. No. 14 seam Loyalabad colliery (Bird & Co.) ; analysis by Alipur Test House.
8. No. 15 seam, Bagdigi colliery (Villiers, Ltd.) ; analysis by Alipur Test House.
9. No. 15 seam, Bultihari colliery (Jardine, Skinner & Co.) ; analysis by Alipur Test House.
10. No. 15 seam, New Tethuriya colliery (Shaw, Wallace & Co.) ; analysis by Alipur Test House.
11. No. 17 seam, Jamadoba colliery (Tata Iron & Steel Co.) ; analysis by Alipur Test House.
12. No. 17 seam, Noonudih-Jitpur colliery (Bengal Iron Co.) ; analysis by Alipur Test House.
13. No. 17 seam, Kendwadith colliery (Macneill & Co.) ; analysis by Alipur Test House.
14. No. 17 seam, Behmandih colliery (H. V. Low & Co.) ; analysis by Alipur Test House.

TABLE IV.—Analyses of typical fairly good Jharia coking coals.

	1	2	3	4	5	6	7	8	9	10	11	12
Moisture	.	.	.	.	.	.	.	.	.	.	.	.
Volatile matter*	14.00	18.75	23.57	20.50	20.70	22.45	20.10	23.00	24.50	25.20	28.05	28.80
Fired carbon*	69.40	63.05	62.83	61.40	62.60	62.05	66.00	61.55	60.20	64.70	60.50	59.30
Ash*	16.60	18.20	13.60	18.10	16.70	15.50	13.90	14.55	15.30	10.10	11.45	11.90
Calorific value (calories)	7,299	6,892	7,576	7,142	6,874	7,245	7,200	7,211	7,240	7,572	7,437	7,209

*Moisture free basis.

1. No. 10 seam, Bastacolla colliery (Balmer, Lawrie & Co.) ; analyses by Alipur Test House.
2. No. 10 seam, Kustore colliery (Kilburn & Co.) ; analysis by Alipur Test House.
3. Nos. 10 and 11 seams, Bhowra colliery (Mackinnon, Mackenzie & Co.) ; analysis by Alipur Test House.
4. No. 11 seam, Ekra Khas colliery (Maharajah of Cossimbazar) ; analysis by Alipur Test House.
5. No. 11 seam, Kusunda Nyadee colliery (Martin & Co.) ; analysis by Alipur Test House.
6. No. 12 seam Bhuggutdih colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
7. No. 12 seam, Central Kirkend colliery (Anderson, Wright & Co.) ; analysis by Alipur Test House.
8. No. 13 seam, Kustore colliery (Kilburn & Co.) ; analysis by Alipur Test House.
9. No. 16 seam, Bhagaband colliery (F. W. Heigers & Co.) ; analysis by Alipur Test House.
10. Nos. 16 and 17 seams, Pootkee colliery (Mackinnon, Mackenzie & Co.) ; analysis by Alipur Test House.
11. No. 18 seam, Jamadoba colliery (Tata Iron & Steel Co.) ; analysis by Alipur Test House.
12. No. 18 seam, Noonudih-Jitpur colliery (Bengal Iron Co.) ; analysis by Alipur Test House.

TABLE V.—Analyses of coking coals, Western portion of the Raniganj coal-field.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moisture	1.35	2.55	2.25	1.48	2.15	2.81	2.10	2.90	2.00	1.52	1.20	1.40	1.40	1.30
Volatile matter*	32.75	34.05	32.80	30.60	31.05	32.00	27.60	27.00	25.30	27.85	25.40	27.40	26.00	22.40
Fixed carbon*	56.00	54.65	55.70	58.60	48.90	59.00	60.00	59.70	57.60	60.90	59.00	59.90	62.00	62.00
Ash	11.25	11.30	11.60	10.80	10.05	9.00	12.40	13.30	17.10	11.25	15.60	12.70	11.40	15.60
Calorific value (calories) . .	7,300	7,169	7,194	7,504	6,346	7,469	7,194	7,271	6,737	7,387	7,170	7,215	7,632	7,223

*Moisture free basis.

1. Dishergarh seam, Parbelia colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
2. Dishergarh seam, Methani colliery (Macneill & Co.) ; analysis by Alipur Test House.
3. Dishergarh seam, Burra Dhemo colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
4. Dishergarh seam, Barnondia colliery (Balmer, Lawrie & Co.) analysis by Alipur Test House.
5. Hatinal seam, Sanctoria colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
6. Sanctoria seam, Seetalpur colliery (Andrew Yule & Co.) ; analysis by Alipur Test House.
7. Begunia seam, Begunia Khas colliery (Maharajah of Cossimbazar) ; analysis by Alipur Test House.
8. Rannagar seam, Rannagar colliery (Martin & Co.) ; analysis by Alipur Test House.
9. Borra (3rd) seam, Borra colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.
10. Victoria top seam, Victoria colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.
11. Victoria middle seam, Victoria colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.
12. Victoria (10' + 17') Bottom seam, Victoria colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.
13. Victoria lower (17') Bottom seam, Victoria colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.
14. Victoria upper (10') Bottom seam, Victoria colliery (Balmer, Lawrie & Co.) ; analysis by Alipur Test House.

TABLE VI.—Analyses of Indian coals and coal ash.

	1	2	3	4	5	6		7
						Lower 24 ft.	Upper 30 ft.	
Moisture	1.50	1.50	1.3	2.0	2.25	1.36	1.91	2.50
Volatile matter	25.10	22.82	27.4	27.4	34.11	31.07	31.19	30.25
Sulphur	0.39	0.24 Fixed	?	..	0.39	0.91	0.65	0.36
Fixed carbon	58.33	0.52 Volatile	57.3	55.20	53.64	52.81	51.33	51.25
Ash—Total	14.68	64.68	14.00	15.40	10.00	14.76	15.35	16.000
Ash details—								
Silica	9.689	4.914	7.072	8.285	5.050	8.66	8.56	7.760
Alumina	3.523	3.939	4.029	3.953	2.400	4.62	5.37	5.612
Ferric oxide	0.616	0.565	1.159	1.760	1.000	1.26	1.04	1.233
Manganese oxide	0.135	?	0.022	0.057	?	..	..	0.305
Lime	0.188	0.816	0.70	0.508	1.000	0.15	0.31	0.240
Magnesia	0.132	0.371	0.141	0.215	0.250	0.02	0.06	0.128
Sulphur trioxide	0.023	?	?	?	?	0.02	0.01	?
	(ash)					(ash)	(ash)	
Phosphorus pentoxide	0.179	0.185	0.508	0.252	0.314	0.12	0.21	0.083
Other constituents	0.187	?	0.477	0.367	?	..	..	0.789
Phosphorus in coal	0.075	0.077	0.213	0.105	0.13	0.05	0.09	0.035

1. Girdih, Serampur colliery, Lower Karharbari seam; probable fair average near Dip Pit. (A. Dawes Robinson.)

2. Jharia, Baraese, machine-out slack coal from lower part of No. 15 seam. (B. Wilson Haigh.)

3. Jharia, Jamadoba, mixed sample upper (7 ft. 6 in.) and lower (5 ft.) No. 18 seam, and 7 ft. of No. 17 seam; 0.434 per cent. TiO_2 . (F. G. Percival.)

4. Raniganj, Ramnagar colliery, Ramnagar seam. This coal provided coke to the Bengal Iron Co. at Kulti. (A. Dawes Robinson.)

5. Raniganj, Sakore colliery, Dishergarh seam. (Ash averaged from two analyses of Dishergarh seam.)

6. Karanpura, Upper Sirka Argada Thick seam (80 feet). This coal cokes very well with Sakore coal (Dishergarh seam).

7. Rampur, Ib Riber, Sambalpur district. Moisture variable and often large. Contains 0.761 per cent. TiO_2 . (F. G. Percival.)

Summing up the situation as we know it at present, it is possible to say that the Indian reserves of coking coal of good quality which can be used, either alone or by very careful mixing, for the preparation of coke of metallurgical quality, are briefly as follows :—

TABLE VII.

Quality.	Field and seams.	Amount in millions of tons (approx.).	Remarks.
I. Highest grade metallurgical coke.	Giridih, Lower Karharbari.	9	Specially low in phosphorus and ash. Suitable for making iron of Bessemer quality or ferro-manganese of standard grade. All allowances made.
	TOTAL .	9	
II. Good metallurgical coke.	Jharia, 13, 14A, 14, 15 and 17.	732	Good quality coal. Total estimated 1,100 million tons. Allowance 33½ per cent. Best coke from coal slack. Excellent coke physically ; sometimes rather high in ash, particularly if made from coal slack. This coke has been utilized in the Kulti furnaces. All allowances made ; 25 million tons each.
	Giridih, Lower Karharbari.	30	
	Raniganj, Victoria. Laikdih and Ramnagar.	50	
	TOTAL .	812	
III. Fair metallurgical coke.	Jharia, 10, 11, 12, 16 and 18.	800	Some of this coal is as good as Class II. Total estimated 1,200 million tons. Allowance 33½ per cent. Best used by carefully mixing with 17 seam or others by experiment. All allowances made. Some of this is known to be of good quality Class II, but there is a little uncertainty about the ash in the remainder. All allowances made.
	Raniganj—		
	Dishergarh . . .	48	
	Sanctoria . . .	36	
	Begunia . . .	25	
	Bokaro, Kargali .	365	
	TOTAL .	1,274	
IV. Good coking coal, but not of metallurgical quality.	Assam fields .	600	Very high in sulphur. If this impurity can be removed, this could be included in Class I or Class II.
	TOTAL .	600	

In regard to the allowance of $33\frac{1}{2}$ per cent. which I have made for losses in working, when calculating the reserves in Table VII, it is necessary to say that this figure has been adopted for the sake of convenience. From my personal knowledge of the Raniganj and Jharia coal-fields during the past three field seasons I can say definitely that in some cases even the high losses stated by Mr. Bathgate have been exceeded, but in other instances, the losses are very much less than $33\frac{1}{2}$ per cent. In a few cases the losses are almost negligible. Taken for definite areas under lease by colliery companies, where the coal of a given seam has been considered as worked-out or entirely unrecoverable at normal market prices, the figure of $33\frac{1}{2}$ per cent. is probably a tolerable average with the methods of mining and marketing in vogue at present. It is a little unfortunate that the term coal research in India is invariably taken as implying experimental work on the preparation of coal for the market or in respect of the efficient use of coal by consumers. There is as big a field for coal research in the examination of the methods of mining now in use and also in the mode of effecting coal sales.

From my own experience the greatest benefit to the coal industry would be the fixing of standard minimum prices for certain kinds of coal. After security of a fair sale price for the coal is obtained attention can be focussed on the still more important subject of economy in working. The compulsory adoption of sand-stowage for all seams of the quality for which market prices have been fixed is essential. Seams which are known to have been on fire must be worked on some system of sand-stowing. Collieries working seams which dip appreciably, and which have been worked on the pillar and stall system are known to have suffered almost total loss in the de-pillaring process. This shows that there is considerable room for improvement in the existing methods of working. Until the subject of efficient methods of extraction are clearly arrived at and adopted for the various, perhaps exceptional circumstances, which arise in the working of Indian coal seams, it is quite useless to allow any percentage for losses in working. It is far more satisfactory to state the *available* reserves—the total which *should* be extracted under perfect methods of working. The amounts of coal destroyed by igneous intrusions, or locked up under railway lands, valuable buildings, or as barriers between properties can be estimated almost exactly. In general the total under these heads is not large. It is when a seam comes to be worked and worked, under very trying market conditions, at a profit

that the losses cannot always be estimated. A single fire has led to the loss of a colliery and involved the coal of adjacent collieries when hopes had previously been entertained of a large profitable extraction. Coal research under the heads of "preparation for the market" and "efficiency in consumption" will lead to economies which should make a given weight of coal give greater heating value and thus save fuel and so give a longer life to the reserves. These factors of economy would not be of very much use to the coal industry in India at the present moment when higher prices and larger outputs seem to offer the only immediate solution to the depressed condition of the trade.

On the basis of the projected requirements of the Indian Iron and Steel Industry for 1928, *i.e.*, about 4 million tons of coking coal to give $2\frac{1}{2}$ million tons of coke, there is enough coal of Classes I and II to last more than 200 years if used exclusively for iron smelting. On the basis of the production of pig iron in Great Britain under normal conditions, *i.e.*, about 6 million tons of pig iron, the requirements of coking coal will be roughly 9 million tons a year, and the calculated reserves of Classes I and II would therefore last 70 years if exclusively utilized for iron smelting. If the reserves in Class III are included, the reserves of coking coal will last 500 years on the 1928 basis, and 200 years on the British basis.

It is ridiculous to imagine that these coals will be exclusively used for the production of metallurgical coke, but with such large margins there is scope for adjustment. There is time for a gradual re-arrangement in the use of coal for various purposes. By so doing, reasonable economies could be effected, whereby the better grades of coking coal may be conserved.

A ZINCH SPINEL, FROM SOUTHERN INDIA. BY W. A. K. CHRISTIE, B.SC., PH.D., M.INST.M.M., *Chemist, Geological Survey of India*, AND A. L. COULSON, M.SC., D.I.C., F.G.S., *Assistant Superintendent, Geological Survey of India.*

THE specimen¹ described below, sent by Messrs. P. Chenga Reddi and Company, Nellore, was found at Tummalatalupur (14° 17' 30" : 79° 42'), near Jogipalli Shrotriem, Nellore district, Madras Presidency.

At one corner of the specimen there are indications of what may be crystal faces and on a part of the fractured surface there are definite, although distorted, striations. There seems to be no simple relationship between the orientation of these and of the problematical crystal faces.

Cleavage is not well developed in the specimen; in thin section it is seen to be octahedral, with four sets of cleavage lines. The mineral has a conchoidal to uneven fracture. It is brittle, with a hardness of 8. Its specific gravity is 4.55. Its lusture is vitreous, shining. The colour of the specimen is greenish black (Ridgway² XIX 37'n to XVIII 35'n). By transmitted light in a section 0.03 m.m. thick it is "dull opaline green" (Ridgway XIX 37'f.). At this thickness the mineral is semitransparent; ordinarily it is opaque. Its refractive index for sodium light is $1.802 \pm .002$ (immersion method with stannic and antimonious iodides in methylene iodide, the index of the liquid being determined in a hollow prism on a goniometer).

One corner of the specimen is encrusted with muscovite and plates of muscovite form frequent inclusions.

¹ Registered number M.-945.

² R. Ridgway, *Colour Standards and Colour Nomenclature*, Washington, 1912.

Carefully picked material has the following composition (W. A. K. Christie) :—

SiO ₂	.	.	.	.	.	.	.	.	.	0.12	per cent.
ZnO	.	.	.	.	.	.	.	.	.	38.90	"
MnO	.	.	.	.	.	.	.	.	.	0.52	"
FeO	.	.	.	.	.	.	.	.	.	4.67	"
Al ₂ O ₃	.	.	.	.	.	.	.	.	.	54.66	"
Fe ₂ O ₃	.	.	.	.	.	.	.	.	.	0.81	"
H ₂ O (below 108°C.).	.	.	.	.	.	.	.	.	.	0.02	"
H ₂ O (above 108°C.)	.	.	.	.	.	.	.	.	.	0.11	"
										<hr/> 99.81	

No other "heavy metals" were found; calcium and magnesium were absent; alkalines were not looked for. The state of oxidation of the manganese is unknown.

The mineral was decomposed by prolonged fusion with twenty times its weight of potassium pyrosulphate. After separation of the silica and elimination of platinum, zinc was precipitated as sulphide in dilute sulphuric acid solution by the method of F. G. Breyer,¹ converted to chloride and titrated with a solution of potassium ferrocyanide. Aluminium, iron and manganese were then precipitated three times with ammonia and hydrogen peroxide, and the oxides weighed together. Total iron and manganese were separately determined, the latter colorimetrically.

The mineral is attacked only with difficulty by a mixture of hydrofluoric and sulphuric acids; ferrous iron was therefore determined by Mitscherlich's method. The mineral was brought into solution by prolonged heating at 250°C. in a sealed tube (from which all air had been displaced by a current of carbon dioxide) with a mixture of one volume of sulphuric acid and one volume of water. Two determinations gave the same figure, 4.67 per cent.

Eliminating silica, water and manganese (which may be present as MnO or Mn₂O₃, or both of these), the percentages of the other constituents are :—

ZnO	.	.	.	.	.	.	.	.	.	39.27
FeO	.	.	.	.	.	.	.	.	.	4.72
Al ₂ O ₃	.	.	.	.	.	.	.	.	.	55.19
Fe ₂ O ₃	.	.	.	.	.	.	.	.	.	0.82
										<hr/> 100.00

¹ W. W. Scott, *Standard Methods of Chemical Analysis*, pp. 483 *et. seq.*, New York, 1917.

This gives a molecular ratio for $(\text{ZnO}, \text{FeO}) : (\text{Al}_2\text{O}_3, \text{Fe}_2\text{O}_3)$ of 1 : 0.997, the theoretical spinel ratio being 1 : 1. If we suppose the manganese to be present in the ideal spinel form as MnO , Mn_2O_3 , the recalculated percentages are:—

ZnO	.	.	.	.	.	.	.	.	.	.	39.06
FeO	.	.	.	.	.	.	.	.	.	.	4.69
MnO	.	.	.	.	.	.	.	.	.	.	0.17
Al_2O_3	.	.	.	.	.	.	.	.	.	.	54.88
Fe_2O_3	.	.	.	.	.	.	.	.	.	.	0.81
Mn_2O_3	.	.	.	.	.	.	.	.	.	.	0.39
											<hr/> 100.00

The molecular ratio of monoxides to sesquioxides is, of course, the same as before, 1 : 0.997. If all the manganese were present as monoxide, the ratio would be 1 : 0.983; if it were all sesquioxide, the ratio would be 1 : 1.003.

The specimen has too much iron to be classed as automolite, too little iron and manganese for dysluite. It is normal gahnite, ZnO , Al_2O_3 , with both radicles replaced to a small extent by iron oxides.

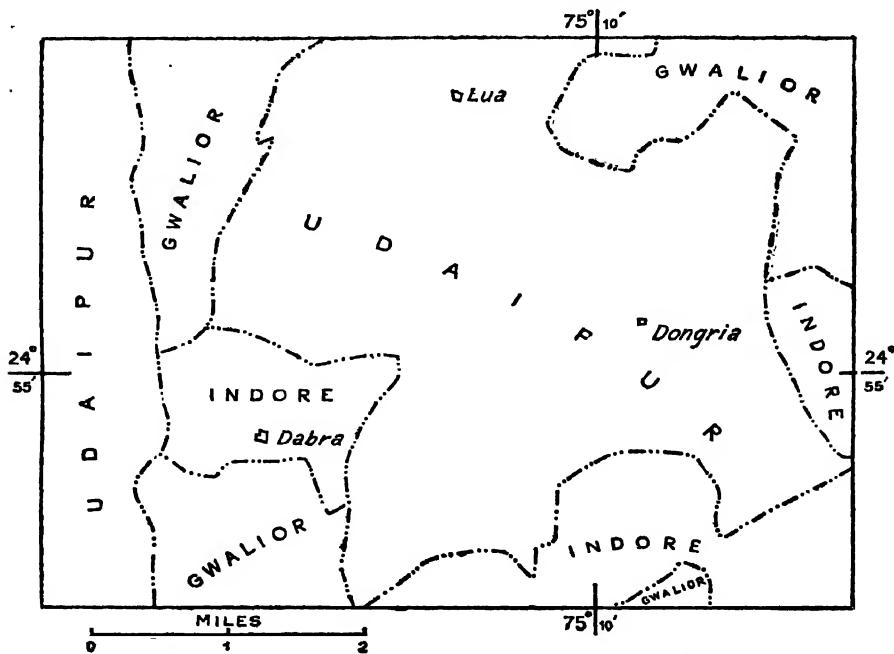
There appears to be only one other recorded occurrence¹ of zinc-spinel in India. C. S. Middlemiss found dysluite near Padiyur in the Coimbatore district of the Madras Presidency. It occurs in irregular masses in a felspar-rock containing corundum and sometimes biotite and muscovite. The felspar-rock occurs as veins in an elaeolite-syenite-gneiss.

¹ L. L. Fermor, *Mem., Geol. Surv. Ind.*, Vol. XXXVII, p. 37 (1909) Cf. also *Rec., Geol. Surv. Ind.*, Vol. XXX, p. 129, 1897. R. Beckenkamp in C. Hintze's "Handbuch der Mineralogie," Bd. 1, Abt. 4, p. 30, cites "R. R. Simpson, *Rec. Geol. Surv. Ind.*, 1910" in connexion with dysluite; this, however, is incorrect.

A NEW INDIAN METEORITE: THE LUA FALL. BY A. L. COULSON, M.SC. (MELB.), D.I.C. (LOND.), F.G.S., *Assistant Superintendent, Geological Survey of India.* (With Plates 21 to 25.)

MENTION of this fall has already been made in the Annual Reports of the Geological Survey of India for 1926 and 1927 (*Rec. Geol. Surv. Ind.*, LX, pt. 1, p. 13; *ibid.* LXI, pt. 1, p. 14). The meteoric shower fell on the afternoon of the 26th June, 1926.

Three fragments of a stone, numbered 292 A, 292 B and 292 C in the meteorite collection of the Geological Survey of India and of a total weight of 200·191 grammes, which fell at Dabra (locally known as Dabda; $24^{\circ} 54' 30'' : 75^{\circ} 7' 30''$) in the Nandwas *pargana* of Indore State, were presented to this department by the Prime Minister of Indore State. A fourth fragment with a weight of 124 grammes was deposited in the Holkar College Science Laboratory, Indore.



Sketch Map showing the positions of Dabra, Dongria and Lua.

One of two fragments of a stone which fell near Dongria (24° 55' 30" : 75° 10' 30") in Udaipur State was presented to this department by the Director, Department of Mines and Geology, Gwalior. This, numbered 292 D, weighed 53·3835 grammes when received. The other specimen, the weight of which was given as 116 grammes, has been retained in Gwalior. What is apparently another fragment of the same stone has been sent to Udaipur; the weight of this piece was $\frac{7}{16}$ of a tola (5·21 grammes).

Two stones, one weighing 8632 grammes and the other $9\frac{7}{16}$ tolas (110·08 grammes) fell upon the same day near Lua (24° 57' : 75° 9') in Udaipur State. These stones were sent to Udaipur but the larger one has since been received by this department on loan from the State authorities.

Thus in all, four stones are known to have fallen, the total weight of fragments recovered from the respective localities of Dabra, Dongria and Lua being 324·19, 174·48 and 3742·08 grammes or 9240·75 grammes in all.

Particulars of the fall at Dabra are given in the following letter from the Prime Minister of Indore State to the Secretary to the Agent to the Governor-General in Central India :—

"Subject ;—Preservation of Aerolites.

"1. I have the honour to state from the reports of the circle Sub-Inspector of Police, Nandwai, and the local Amin that on the 26th June, 1926, at 4-30 P. M. there was a great thunderstorm which lasted for about 7 minutes and at the same time a meteorite fell in the jungles of Dabda *pargana*, Nandwai. As the meteorite fell on a stone it went to pieces. The fall of the meteorite was witnessed by one Pitha Teli of the Dabda village who had been to the jungle for fetching firewood.

"2. Three pieces of a meteorite are sent herewith.

"3. It is also reported that a meteorite fell in Mouza Lua, Pargana Begu of the Udaipur State."

Enquiries made by this department elicited the following information from Pitha Teli given in a letter from the Prime Minister, Indore State, to the Secretary to the Agent to the Governor-General in Central India :—

"1. No light phenomena accompanied the fall; but there was a loud noise.

2. The meteorite fell towards the west.

3. Pitha Teli having been frightened, ran towards the village and came back after half an hour with some villagers, when the pieces picked up were found cold.

4. There was no characteristic smell in the neighbourhood.

5. As the meteorite fell on rocky ground, it went into pieces. Four pieces were recovered, three of which have been sent to you and the fourth deposited in the Holkar College Science Laboratory."

When Mr. G. H. Tipper of this department was in Gwalior and was shown two pieces of a meteorite, he suggested that one piece be sent to the Geological Survey of India.

Circumstances of the fall at Dongria. This was done and a collection of geological

specimens was forwarded in exchange. It was first stated that the two pieces were picked up near Singoli (24° 58': 75° 17' 30") on "one of the hills near Bengu (Mewar)" and that the time of fall was 4 P.M. on the 26th June, 1926. Later, however, the following letter was received from the Director, Department of Mines and Geology, Gwalior:—

"With reference to the falls of meteorites at Dabra and Lua mentioned in your departmental report for 1926, I beg to inform you that there appears to be a very close connection between these falls and the fragment of meteorite I sent to you with my letter No. 506, dated 15th January 1927. The fragments mentioned in my letter were actually picked up from a hill within the boundaries of the village Dongria (75° 14'; 24° 55', Map Sheet 236).

"The Thikanedar of Begu reports that there was a fall of one stone on the 26th June, 1926, near Lua, which weighed 9 $\frac{1}{2}$ tolas and that there occurred another fall at Dongria on the same day. He could get only a fragment from the latter locality which weighed $\frac{1}{2}$ of a tola. He sent both these stones to Udaipur.

"The above information together with the fall at Dabra mentioned by you, the closeness of the localities Dabra, Lua and Dongria and the date of the falls shows that the three falls were parts of a bigger one. The eye-witnesses say that there was a loud report like that of firing of a cannon and that the 'thunder-bolt' came from the south and dropped in the north-easterly direction.

"A comparison of the fragment sent by me with those you may have obtained from Dabra may prove the above supposition."

Circumstances of the fall at Lua.

The following letter was received from the Resident in Mewar, Rajputana:—

"With reference to your letter No. 3987/399, dated the 14th September, 1926, I have the honour to advise the despatch of a parcel by rail containing a fragment of the meteorite which is reported to have fallen in the village of Lua, Putta Begun, in the Mewar State, sometime between 3 and 3-30 P.M. on the 26th June, 1926, preceded by a loud atmospheric thunder."

Lua is 3 miles N. N. E. of Dabra and Dongria is 3 miles E. N. E. of the same village. Falling upon the same day at local-

Correlation of falls.

ities within an area of a diameter of three miles, the connexion between the Dabra, Dongria and Lua falls is at once apparent. In addition, examination of

the specimens brings out the resemblance between the fragments. Accordingly the four fragments in the possession of this department have been given one number, 292, and the meteorite called after the village from which the largest fragment was recovered, *viz.*, Lua.

It will be noted that there is a considerable difference in the recorded times of fall. As watches are rare in country districts,

Time of fall. this is not to be wondered at. The Dabra stone is said to have fallen at 4-30 P.M. and the Dongria stone at 4 P.M.; no time is given for the fall at Lua of the stone weighing 110.08 grammes, but it is stated that the larger stone, that weighing 8632 grammes, fell between 3 and 3-30 P.M.

The three localities form almost an equilateral triangle and consequently it is impossible to work out the direction of fall as has been done by L. L. Fermor¹ in connexion

Direction of fall. with the Dokachi meteoric shower, notwithstanding the fact that the largest mass fell at the northern apex of the triangle. Pitha Teli (*supra.*, p. 319) has stated that the Dabra stone fell "towards the west." This might mean that it fell in the jungle west of the village or, alternatively, that its direction of fall was towards the west.

As this shower reached the earth between 3 P.M. and 4-30 P.M., *i.e.*, between the hours of noon and midnight, the meteorite from the disruption of which the several stones were formed, had direct motion,² *i.e.*, it must have been moving in the same direction as the earth in its orbit and thus reached the earth by overtaking it.

When received, 292A weighed 155.042 grammes. Its longest axis is about $3\frac{1}{4}$ ches and it is obviously a fragment of a larger stone, its faces apart from the crust being fracture surfaces. A prominent crack traverses what is the bottom part of the specimen when held as depicted upon Plate 21 (figure 1); and it would require but little strain to break the specimen into two pieces. This incipient fracture probably occurred at the moment of impact on the rock as noticed by Pitha Teli. The front face is roughly parallel to the rear face but whilst the crust is convex, the opposite fractured surface is approximately plane.

¹ *Rec. Geol. Surv. Ind.*, XXXV, pt. 1, 1907, pp. 73, 74.

² "Meteorites," Farrington, Chicago, 1915, p. 43.

The crust is black, thin and very smooth and shows up in marked contrast to the grey of the fractured surfaces. Abundant small glistening faces of troilite, rust aggregates, rounded forms of nickel-iron resembling chondri and large white chondri, one of which has a diameter of 4mm. can be seen with the aid of a lens.

No. 292 B weighed 35.642 grammes when it was received by this department. It is shown upon Plate 21 (figure 4) and it again is definitely a fragment of a larger meteorite.

No. 292 B. It possesses but little crust and what little there is has been flaked away in its central portion. The specimen is roughly pyramidal in shape and though grey when first received, it has become rust-covered in the moist atmosphere of Calcutta. A definite chondritic structure and glistening faces of bronze-yellow troilite can be seen by the naked eye. This fragment is to be presented to the British Museum.

When received No. 292 C weighed 9.506 grammes and it is shown on Plate 21 (figure 5). Though also definitely part of a larger stone, it exhibits a moderate area of crust which is rusty-black in colour. This fragment was found to have a specific gravity of 3.534.

From .113 grammes of this specimen, a thin section¹ was made, a photo-micrograph of which is shown on Plate 21 (figure 2). The section shows very well the chondritic structure of the meteorite, olivine forming numerous chondri which are chiefly polysomatic. Apart from the chondri and from nickel-iron and troilite, which occupy the spaces between the chondri, the only other mineral recognizable in the section is enstatite which forms an indistinct fibrous and eccentric chondrus and also occurs as a rectangular fibrous fragment (Plate 21, figure 2) entirely surrounded by troilite.

Fragments do not fit. All attempts to join these three fragments were unsuccessful though they are apparently part of the same stone.

No. 292 D, the specimen from Dongria, depicted upon Plate 21 (figure 3) weighed 53.3835 grammes when received by the Geological Survey of India. There is an almost complete

No. 292 D. equatorial belt of thin, black crust encircling the fragment, which is undoubtedly part of a different stone from that which fell at Dabra. An examination of the specimen suggests that the fragment is the central part of a meteorite from which at

¹Number 18054 in the register of microscope slides, Geological Survey of India.

least four other fragments have been detached either by the impact of landing or by human agency.

The crust is interesting in that it shows a few small pits where the nickel-iron has oxidised sufficiently to form with the silicates a relatively fusible compound ; some rounded knobs can also be seen. The smooth crinkling of the crust is well shown in the photograph.

The specimen shows chondritic structure and with a lens iron-grey and tin-white nickel-iron and bronze-yellow troilite can be discerned. There is a purplish-red aggregation of material on the top edge of the specimen, microscopic examination of which indicated it to be composed of small crystals of olivine with rust aggregates. Of the five specimens examined, this alone possesses a marked bluish colour.

When received by this department, the large stone from Lua weighed 8632 grammes. It is a very fine specimen and is almost complete ; an examination of its crustless areas suggests that a total of not more than about 200 grammes of the stone has been broken off either at the time of impact with the earth or subsequently by human agency.

The stone possesses two relatively plane surfaces which are roughly parallel to each other and whose distance apart averages about $3\frac{1}{2}$ inches. This parallelism is well shown on Plates 23 and 24 (figure 1 on both plates). When inspected in the position shown on Plate 22 (figure 1), the stone has the appearance of an arrow-head, the maximum width being $9\frac{1}{2}$ inches and height 6 inches ; the base is concave.

The crust has the usual greyish-black colour and in places appears to be about 1mm. in thickness though it is generally less than this. On certain surfaces there appears to be a development of secondary crusts. Such flow lines as are found on the original crust are indefinite in direction and one cannot be sure of the position of the stone during its journey to the earth.¹

A small surface of the crust of the fall shown in Plate II, figure 2, is seen in natural size on Plate 24 (figure 2) ; this shows the presence of small pits and knobs. Larger hollows in the surfaces can be observed (*see also* Plates 22 and 23). In Plate 22 (figure 1), two corrugated depressions may be seen on the surface of the meteorite on the right-hand side, one being fresh and caused by the impact

¹ *Rec., Geol. Surv. Ind.*, XXXIX, pt. 1, 1927, p. 146.

of the stone with the earth and the other showing similar corrugations but coated with crust.

A thin section (No. 18130) made from a small chip of this stone is very similar to the slide of the Dabra specimen, 292 C. Numerous polysomatic chondri of olivine are shown, the spaces between which are generally occupied by nickel-iron and troilite; some of the individual olivine crystals are relatively large. There are intergrowths of fibrous enstatite with olivine in some of the chondri (*see* Plate 25); but eccentric rayed masses of enstatite, which sometimes form separate chondri, can also be distinguished.

Though no chemical analysis of any of the fragments has been made, it is proposed to classify the stones of this meteorite shower as follows:—Stone; No. 20, Grey Chondrite, Cg of Brezina.

Classification.

EXPLANATION OF PLATES.

PLATE 21. FIGURE 1.—292A, Dabra, Indore State.

- “ „ 2.—Photomicrograph of the Dabra meteorite from the Lua fall, No. 292C, showing a rectangular fibrous aggregate of enstatite and chondri of olivine.
- “ „ 3.—292D, Dongria, Udaipur State.
- “ „ 4.—292B, Dabra, Indore State.
- “ „ 5.—292C, Dabra, Indore State.
- “ 22. FIGURES 1 and 2.—The Lua meteorite, Udaipur State (front and rear views).
- “ 23. „ 1 and 2—The Lua meteorite, Udaipur State (end and bottom views).
- “ 24. FIGURE 1.—The Lua meteorite (end view).
- “ „ 2.—Portion of the crust of the face of the Lua meteorite shown in Plate 22, figure 2 (natural size).
- “ 25. „ 1.—Photomicrograph of the Lua meteorite, showing a fibrous aggregate of enstatite and chondri of olivine.
- “ „ 2.—Photomicrograph of the Lua meteorite showing an idiomorphic crystal of olivine in a polysomatic chondrus of olivine and also other chondri of olivine,

MISCELLANEOUS NOTE.

Löllingite from the Hazaribagh District, Bihar and Orissa.

A mineral found in small amount in the Durria Mica Mine, situated in square Q 28 in the Kodarma Government Forest, and sent by Messrs. Tata Sons, Ltd., to this Department for examination and report has been identified as löllingite. There are not many previously recorded occurrences of the minerals of this group but leucopyrite has long been known to occur in the Hazaribagh district.¹

The mineral, which is registered as M. 983 in the collections of the Geological Survey of India, has a density of 7.40. It contains abundant iron and arsenic, a little antimony and sulphur, but no cobalt or bismuth. Its high density indicates it to be the löllingite variety of the löllingite group.

Two small pieces of a mineral broken from a lump about the size of a football which had been found in one of Messrs. Tata Sons, Ltd.'s mica mines in square Q 28 in the Kodarma Government Forest, were forwarded by Mr. F. G. Percival of the Tata Iron and Steel Co., Ltd., and are interesting in this connexion in that they are varieties of löllingite.

One of these, M 980, has a density of 7.05 and contains abundant iron and arsenic with a little sulphur, antimony and bismuth, but no cobalt. The other, M 981, has a density of 6.55 and contains abundant iron and arsenic with a little sulphur and bismuth, but no antimony or cobalt.

In both instances the density was determined by means of the chemical balance, using polished fragments of the minerals; but even such polished material of the latter specimen contained a decomposition product in very thin veins. Pure material of M 981, were it possible to obtain it, might have a sufficiently high density (7.0)² to allow it to be classed with M 980 as leucopyrite.

The colour of all three specimens is steel-grey to silver-white and their streak is greyish black; their hardness is 5.5.

A. L. COULSON.

¹ Mallet, *Rec. Geol. Surv. Ind.*, VII, pt. 1, p. 43, 1874. Holland, *Mem. Geol. Surv. Ind.*, XXXIV, pt. 2, pp. 31, 51, 1902. Coulson, *Rec. Geol. Surv. Ind.*, LXI, pt. 2, p. 206, 1928.

² Dana, *Mineralogy*, p. 96.

GEOLOGICAL SURVEY OF INDIA

Records, Vol. LXI, Pl. 21.



Fig. 1.—292 A. DABRA.



Fig. 2.—292 C. DABRA, (Photomicrograph X 29.)



Fig. 3.—292 D. DONGRIA.
K. F. Watkinson, Photos.



Fig. 4.—292 B. DABRA.



Fig. 5.—292 C. DABRA.
G. S. I Calcutta

THE DABRA AND DONGRIA METEORITES FROM THE LUA FALL.

(All about natural size.)

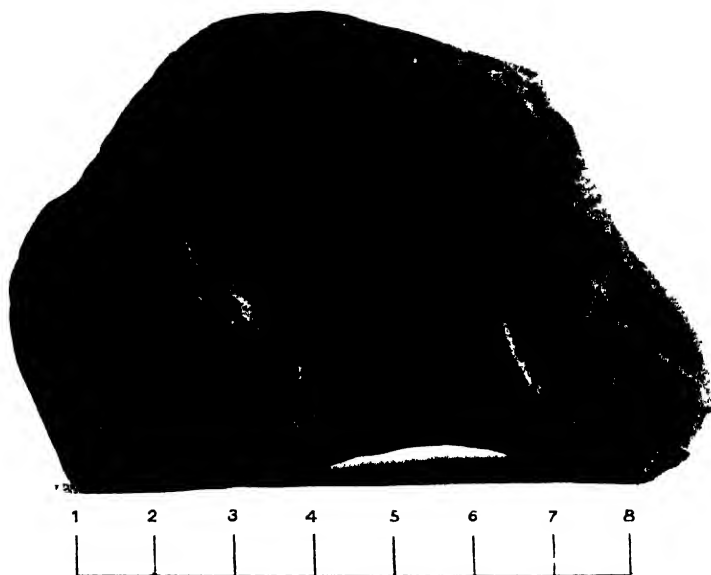


Fig. 1. Front view (the scale is in inches).

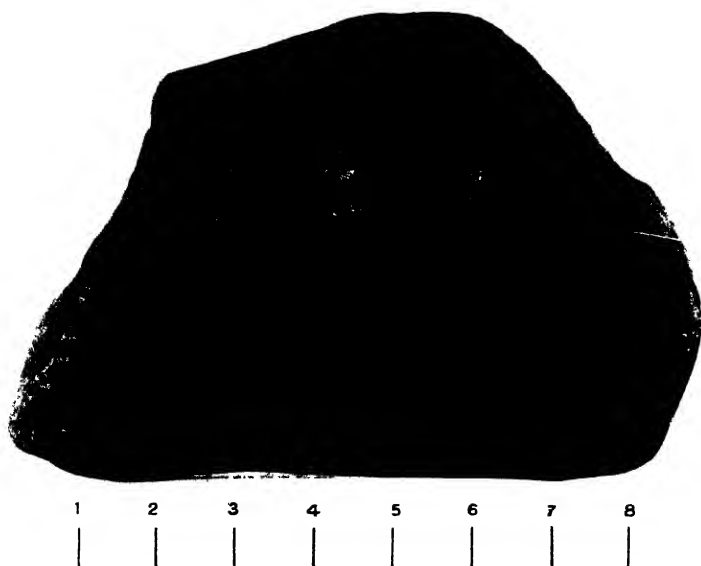


Fig. 2. Rear view (the scale is in inches).



Fig 1. End view (the scale is in inches).

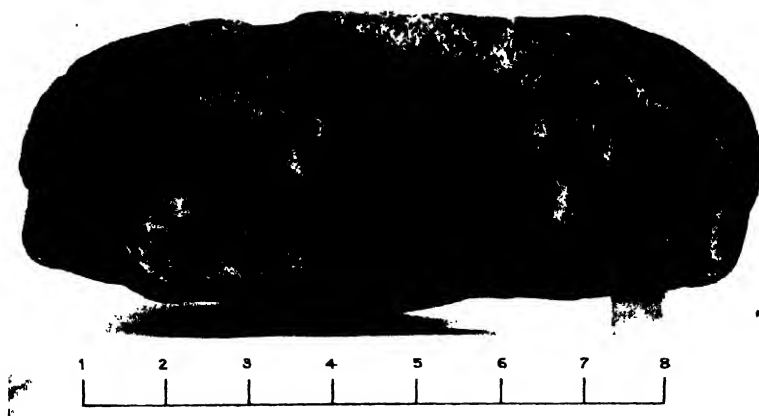


Fig. 2. Bottom view (the scale is in inches).

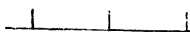


Fig. 1. End view (the scale is in inches).



Fig. 2. Portion of the Crust shown in Fig. 2, plate 22, (natural size.)

K. F. Watkinson, Photos.

G. S. I. Calcutta

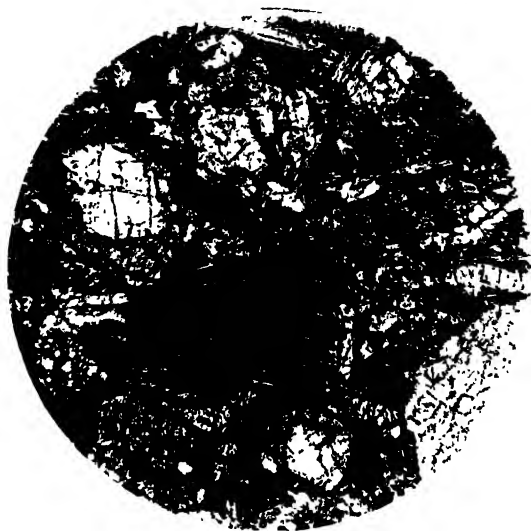


Fig 1. Photomicrograph of Lua meteorite ($\times 36$).



Fig. 2. Photomicrograph of Lua meteorite ($\times 36$).

T. C. Chowdhury, Photos.

G. S. I. Calcutta

THE LUA METEORITE.

Part 3 (out of print).—Geology and Economic Resources of Country adjoining Sind-Pishin Railway between Shatigh and Spintangi, and of country between it and Khattan. Journey through India in 1888-89, by Dr. Johannes Walther. Coal-fields of Lairunga, Maosandram, and Mao-be-lar-kar, in the Khasi Hills. Indian Steatite. Provisional Index of Local Distribution of Important Minerals, Miscellaneous Minerals, Gem Stones, and Quarry Stones in Indian Empire.

Part 4 (out of print).—Geological sketch of Naini Tal; with remarks on natural conditions governing mountain slopes. Fossil Indian Bird Bones. Darjiling Coal between Lian and Ramthi rivers. Basic Eruptive Rocks of Kadapha Area. Deep Boring at Lucknow. Coal Seam of Dore Ravine, Hazara.

VOL. XXIV, 1891.

Part 1 (out of print).—Geology of the Salt Range of the Punjab with a reconsidered theory of Origin and Age of Salt-Marl, Graphite in decomposed Gneiss (Laterite) in Ceylon. Glaciers of Kabru, Pandin, etc. Salts of Sambhar Lake in Rajputana, and 'Roh' from Aligarh in North-Western Provinces. Analysis of Dolomite from Salt-range, Punjab.

Part 2 (out of print).—Oil near Moghal Kot, in Sherani country, Sahaman Hills Mineral States. Reported Namsaka Ruby-Mine in Maunglön State. Tourmaline (Schorl) Mines in Maunglön State. Salt spring near Bawgyo, Thibaw State.

Part 3 (out of print).—Boring in Daltongunj Coal field, Palamow. Death of Dr. P. Martin Duncan. Pyroxenic varieties of Gneiss and Soapstone bearing Rocks.

Part 4 (out of print).—Mammalian Bones from Mongolia. Darjiling Coal Exploration. Geology and Mineral Resources of Sikkim. Rocks from the Salt range, Punjab.

VOL. XXV, 1892

Part 1 (out of print).—Annual report for 1891. Geology of Thal Choshih and part of Mazi country. Petrological Notes on Boulder-bed of Salt range, Punjab. Subrecent and Recent Deposits of valley plains of Quetta, Pishin, and Dasht-i-Bodalot; with appendices on Chamans of Quetta; and Artesian water-supply of Quetta and Pishin.

Part 2 (out of print).—Geology of Safed Koh. Jherria Coal-field.

Part 3 (out of print).—Locality of Indian Tscheulkinite. Geological Sketch of country north of Bhamo. Economic resources of Amber and Jade mines area in Upper Burma. Iron-ore and Iron industries of Salem District. Rubeckite in India. Oil on Great Tenasserim River, Lower Burma.

Part 4 (out of print).—Oil Springs at Mogal Kot in Shirani Hills. Mineral Oil from Salejman Hills. New Amber-like Resin in Burma. Tertiary Deposits of Salt range.

VOL. XXVI, 1893.

Part 1 (out of print).—Annual report for 1892. Central Himalayas. Julets in Upper Burma. Burmite, now Fossil Resin from Upper Burma. Prospecting Operations, Mergui District, 1891-92.

Part 2 (out of print).—Earthquake in Baluchistan of 20th December 1892. Burmite, new amber-like fossils from Upper Burma. Alluvial deposits and Subterranean water-supply of Rangoon.

Part 3 (out of print).—Geology of Sherani Hills. Carboniferous Fossils from Tenasserim. Boring at Chandernagore. Granite in Tavoy and Mergui.

Part 4 (out of print).—Geology of country between Chappar Ruit and Harnai in Baluchistan. Geology of part of Tenasserim Valley with special reference to Tondau-Kamapping Coal-field. Magnetite containing Manganesous and Aluminous. Ilmenite.

VOL. XXVII, 1894.

Part 1 (out of print).—Annual report for 1893. Bhaganwala Coal-field, Salt-range, Punjab.

Part 2 (out of print).—Petroleum from Burma. Singareni Coal-field, Hyderabad (Deccan), Gohna Landslip, Garhwal.

Part 3 (out of print).—Cambrian Formation of Eastern Salt-range. (Gudih (Kharbari) Coal-fields. Chipped (?) Flints in Upper Miocene of Burma. Velates Schmideliana, Chemn., and Provelates grandis, Sov. sp., in Tertiary Formation of India and Burma.

Part 4 (out of print).—Geology of Wuntho in Upper Burma. Echinoids from Upper Cretaceous System of Baluchistan. Highly Phosphatic Mica Peridotites intrusive in Lower Gondwana Rocks of Bengal. Mica-Hypersthene-tremblende-Peridotite in Bengal.

VOL. XXVIII, 1895.

- Part 1.*—Annual report for 1894. Cretaceous Formation of Pondicherry. Early allusion to Barren Island. Bibliography of Barren island and Narcondam from 1884 to 1894.
- Part 2 (out of print).*—Cretaceous Rocks of Southern India and geographical conditions during later Cretaceous times. Experimental Boring for Petroleum at Sukkur from October 1893 to March 1895. Tertiary system in Burma.
- Part 3 (out of print).*—Jadeite and other rocks, from Tammaw in Upper Burma. Geology of Tochi Valley. Lower Gondwanas in Argentina.
- Part 4 (out of print).*—Igneous Rocks of Giridih (Kurhurbaree) Coal-field and their Contact Effects. Vindhyan system south of Sone and their relation to so-called Lower Vindhyan. Lower Vindhyan area of Sone Valley. Tertiary system in Burma.

VOL. XXIX, 1896.

- Part 1 (out of print).*—Annual report for 1895. Acicular inclusions in Indian Garnets. Origin and Growth of Garnets and of their Micropegmatitic intergrowths in Pyroxenic rocks.
- Part 2 (out of print).*—Ultra-basic rocks and derived minerals of Chalk (Magnesite) hills, and other localities near Salem, Madras. Corundum localities in Salem and Coimbatore districts, Madras. Corundum and Kyanite in Manbhum district, Bengal. Ancient Geography of "Gondwana-land." Notes.
- Part 3.*—Igneous Rocks from the Tochi Valley. Notes.
- Part 4 (out of print).*—Steatite mines, Minbu district, Burma. Lower Vindhyan (Suhkaimur) area of Sone Valley, Rewah. Notes.

VOL. XXX, 1897.

- Part 1.*—Annual report for 1896. Norite and associated Basic Dykes and Lava-flows in Southern India. Genus Vertebraria. On Glossopteris and Vertebraria.
- Part 2.*—Cretaceous Deposits of Pondicherry. Notes.
- Part 3 (out of print).*—Flow structure in igneous dyke. Olivine-norite dykes at Coonoor. Excavations for corundum near Palakod, Salem District. Occurrence of coal at Palana in Bikanir. Geological specimens collected by Afghan-Baluch Boundary Commission of 1896.
- Part 4 (out of print).*—Nemalite from Afghanistan. Quartz-barytes rock in Salem district, Madras Presidency. Worn femur of Hippopotamus iravadicus, Caut. and Falc., from Lower Pliocene of Burma. Supposed coal at Jaintia, Baxa Dyars. Percussion Figures on micas. Notes.

VOL. XXXI, 1904.

- Part 1 (out of print).*—Prefatory Notice. Copper-ore near Komai, Darjeeling district. Zewan beds in Vihi district, Kashmir. Coal deposits of Isa Khel, Mianwali district, Punjab. Um-Kileng coal-beds, Assam. Sapphirine-bearing rock from Vizagapatam District. Miscellaneous Notes. Assays.
- Part 2 (out of print).*—Lt.-Genl. C. A. McMahon. Cyclobus Haydeni Diener. Auriferous Occurrences of Chota Nagpur, Bengal. On the feasibility of introducing modern methods of Coke-making at East Indian Railway Collieries, with supplementary note by Director, Geological Survey of India. Miscellaneous Notes.
- Part 3 (out of print).*—Upper Palaeozoic formations of Eurasia. Glaciation and History of Sind Valley. Halorites in Trias of Baluchistan. Geology and Mineral Resources of Mayurbhanj. Miscellaneous Notes.
- Part 4 (out of print).*—Geology of Upper Assam. Auriferous Occurrences of Assam. Curious occurrence of Scapolite from Madras Presidency. Miscellaneous Notes. Index.

VOL. XXXII, 1905.

- Part 1 (out of print).*—Review of Mineral Production of India during 1898—1903.
- Part 2 (out of print).*—General report, April 1903 to December 1904. Geology of Provinces of Tsang and U in Tibet. Bauxite in India. Miscellaneous Notes.
- Part 3 (out of print).*—Anthracolithic Fauna from Subansiri Gorge, Assam. Elephas Antiquus (Namadicus) in Godavari Alluvium. Triassic Fauna of Tropites-Limestone of Byas. Amblygonite in Kashmir. Miscellaneous Notes.
- Part 4.*—Obituary notices of H. B. Medlicott and W. T. Blanford. Kangra Earthquake of 4th April 1905. Index to Volume XXXII.

Vol. XXXIII, 1906.

- Part 1 (out of print).*—Mineral Production of India during 1904. Pleistocene Movement in Indian Peninsula. Recent Changes in Course of Nam-tu River, Northern Shan States. Natural Bridge in Gokteik Gorge. Geology and Mineral Resources of Narnaul District (Patiala State). Miscellaneous Notes.
- Part 2 (out of print).*—General report for 1905. Lashio Coal-field, Northern Shan States. Nanna, Mawngang and Man-se-le Coal-fields, Northern Shan States, Burma. Miscellaneous Notes.
- Part 3 (out of print).*—Petrology and Manganese-ore Deposits of Sausar Tahsil, Chhindwara district, Central Provinces. Geology of part of valley of Kannan River in Nagpur and Chhindwara districts, Central Provinces. Manganite from Sandur Hills. Miscellaneous Notes.
- Part 4 (out of print).*—Composition and Quality of Indian Coals. Classification of the Vindhyan System. Geology of State of Panua with reference to the Diamond-bearing Deposits. Index to Volume XXXIII.

Vol. XXXIV, 1906.

- Part 1 (out of print).*—Fossils from Halorites Limestone of Bambanag Cliff, Kumaon. Upper Triassic Fauna from Pishin District, Baluchistan. Geology of portion of Bhutan. Coal Occurrences in Foot-hills of Bhutan. Dandli Coal-field: Coal outcrops in Kotli Tehsil of Jammu State. Miscellaneous Notes.
- Part 2 (out of print).*—Mineral Production of India during 1905. Nummulites Douvillei, with remarks on Zonal Distribution of Indian Nummulites. Auriferous Tracts in Southern India. Abandonment of Collieries at Warora, Central Provinces. Miscellaneous Notes.
- Part 3 (out of print).*—Explosion Craters in Lower Chindwin District, Burma. Lavas of Paragad Hill. Gibbsite with Manganese-ore from Talevadi, Belgaum district, and Gibbsite from Bhelkewli, Satara District. Classification of Tertiary System in Sind with reference to Zonal distribution of Eocene Echinoidea.
- Part 4 (out of print).*—Jaipur and Nazira Coal-fields, Upper Assam. Makum Coal-fields between Tirap and Namdang Streams. Kobat Anticline, near Seiktein, Myingyan district, Upper Burma. Asymmetry of Yanangyat-Singu Anticline, Upper Burma. Northern part of Gwegyo Anticline, Myingyan District, Upper Burma. Breyia Multituberculata, from Nari of Baluchistan and Sind. Index to Volume XXXIV.

Vol. XXXV, 1907.

- Part 1 (out of print).*—General report for 1906. Orthophragmina and Lepidocyclina in Nummulitic Series. Meteoric Shower of 22nd October 1903 at Dokachi and neighbourhood, Dacca district.
- Part 2 (out of print).*—Indian Acrolites. Brine-wells at Bawgyo, Northern Shan States. Gold-bearing Deposits of Loi Twang, Shan States. Physa Principii in Maastrichtian strata of Baluchistan. Miscellaneous Notes.
- Part 3.*—Preliminary survey of certain Glaciers in North-West Himalaya. A.—Notes on certain Glaciers in North-West Kashmir.
- Part 4.*—Preliminary survey of certain Glaciers in North-West Himalaya. B.—Notes on certain Glaciers in Lahaul. C.—Notes on certain Glaciers in Kumaon. Index to Volume XXXV.

Vol. XXXVI, 1907-08.

- Part 1 (out of print).*—Petrological Study of Rocks from hill tracts, Vizagapatam district, Madras Presidency. Nepheline Syenites from hill tracts, Vizagapatam district, Madras Presidency. Stratigraphical Position of Gangamopteris Beds of Kashmir. Volcanic outburst of Late Tertiary Age in Souh Hsenwi, N. Shan States. New suide from Bugti Hills, Baluchistan. Permo-Carboniferous Plants from Kashmir.
- Part 2 (out of print).*—Mineral Production of India during 1906. Ammonites of Bagh Beds. Miscellaneous Notes.
- Part 3 (out of print).*—Marine fossils in Yanangyaung oil-field, Upper Burma. Freshwater shells of genus Batissa in Yanangyaung oil-field, Upper Burma. New Species of Dendrophylia from Upper Miocene of Burma. Structure and age of Taungtha hills, Myingyan district, Upper Burma. Fossils from Sedimentary rocks of Oman (Arabia). Rubies in Kachin Hills, Upper Burma. Cretaceous Orbitoides of India. Two Calcutta Earthquakes of 1906. Miscellaneous Notes.

Part 4 (out of print).—Pseudo-Fucoids from Fab sandstones at Fort Munro, and from Vindhyan series, Jadeite in Kachin Hills, Upper Burma. Wetchok-Yedwet Pegu outcrop, Magwe district, Upper Burma. Group of Manganates, comprising Hollandite, Psilomilane and Coronadite. Occurrence of Wolfram in Nagpur district, Central Provinces. Miscellaneous Notes. Index to Volume XXXVI.

VOL. XXXVII, 1908-09.

- Part 1 (out of print).—General report for 1907. Mineral Production of India during 1907. Occurrence of striated boulders in Blaini formation of Simla. Miscellaneous Notes.*
Part 2 (out of print).—Tertiary and Post-tertiary Freshwater Deposits of Baluchistan and Sind. Geology and Mineral Resources of Rajpipla State. Suitability of sands in Rajmahal Hills for glass manufacture. Three new Manganese-bearing minerals:—Vrdenburgite, Sitaparite and Juddite. Laterites from Central Provinces. Miscellaneous Notes.
Part 3 (out of print).—Southern part of Gwegyo Hills, including Payagyigon-Ngashandaung Oil-field. Silver-lead mines of Bawdwin, Northern Shan States. Mud volcanoes of Arakan Coast, Burma.
Part 4.—Gypsum Deposits in Hamirpur district, United Provinces. Gondwanas and related marine sedimentary system of Kashmir. Miscellaneous Notes. Index to Volume XXXVII.

VOL. XXXVIII, 1909-10.

- Part 1.—General report for 1908. Mineral Production of India during 1908.*
Part 2 (out of print).—Ostrea latimarginata in "Yenangyaung stage" of Burma. China-clay and Fire-clay deposits in Rajmahal Hills. Coal at Gilhurria in Rajmahal hills. Pegu Inlier at Ondwe, Magwe district, Upper Burma. Salt Deposits of Rajputana. Miscellaneous Notes.
Part 3.—Geology of Sarawan, Jhalawan, Mekran and the State of Las Bels. Hippurite-bearing Limestone in Scistan and Geology of adjoining region. Fusulinidae from Afghanistan. Miscellaneous Notes.
Part 4.—Geology and Prospects of Oil in Western Prome and Kama, Lower Burma (including Namayan, Padaung, Taungbogyi and Ziaing). Recorrelation of Pegu system in Burma with notes on Horizon of Oil-bearing Strata (including Geology of Padaukpin, Banbyin and Aukmanein). Fossil Fish Teeth from Pegu system, Burma. Northern part of Yenangyat Oil-field. Iron Ores of Chanda, Central Provinces. Geology of Aden Hinterland. Petrological Notes on rocks near Aden. Upper Jurassic Fossils near Aden. Miscellaneous Notes. Index to Volume XXXVIII.

VOL. XXXIX, 1910.

Quinquennial Review of Mineral Production of India during 1904 to 1908.

VOL. XL, 1910.

- Part 1.—Pre-Carboniferous Life-Provinces. Lakes of Salt Range in the Punjab. Preliminary survey of certain Glaciers in Himalaya. D.—Notes on certain glaciers in Sikkim. New Mammalian Genera and Species from Tertiaries of India.*
Part 2 (out of print).—General Report for 1909. Mineral Production of India during 1909.
Part 3.—Revised Classification of Tertiary Freshwater Deposits of India. Revision of Silurian-Trias Sequence in Kashmir. Fenestella-bearing beds in Kashmir.
Part 4 (out of print).—Alum Shale and Alum Manufacture, Kalabagh, Mianwali district, Punjab. Coal-fields in North-Eastern Assam. Sedimentary Deposition of Oil. Miscellaneous Notes. Index to Volume XL.

VOL. XLI, 1911-12.

- Part 1.—Age and continuation in Depth of Manganese-ores of Nagpur-Balaghat Area, Central Provinces. Manganese-ore deposits of Rangpur State, Bengal, and Distribution of Gondite Series in India. Baluchistan Earthquake of 21st October 1909. Identity of Ostrea Promensis, Noetling, from Pegu System of Burma and Ostrea Digitalis, Eichwald from Miocene of Europe. Mr. T. R. Blyth. Miscellaneous Notes.*
Part 2.—General report for 1910. Devonian Fossils from Chitral, Persia, Afghanistan and Himalayas. Sections in Pir Panjal Range and Sind Valley, Kashmir.
Part 3.—Mineral Production of India during 1910. Samarskite and other minerals in Nellore District, Madras Presidency. Coal in Namchik Valley, Upper Assam. Miscellaneous Notes.
Part 4.—Pegu-Eocene Succession in Minbu District near Ngape. Geology of Henzada District, Burma. Geology of Lonar Lake with note on Lonar Soda Deposit. International Geological Congress of Stockholm. Miscellaneous Notes. Index to Volume XLI.

VOL. XLII, 1912.

- Part 1.*—Survival of Miocene Oyster in Recent Seas. Silurian Fossils from Kashmir. Blödite from Salt Range. Gold-bearing Deposits of Mong Long, Haipaw State, Northern Shan States, Burma. Steatite Deposits, Idar State. Miscellaneous Notes.
- Part 2.*—General Report for 1911. Dicotyledonous Leaves from Coal Measures of Assam. Poting Glacier, Kumaon, Himalaya, June 1911. Miscellaneous Notes.
- Part 3.*—Mineral Production of India during 1911. Kodurite Series.
- Part 4.*—Geological Reconnaissance through Dehong Valley, being Geological Results of Abor Expedition, 1911-12. Traverse Across the Naga Hills of Assam. Indian Aërolites. Miscellaneous Notes.

VOL. XLIII, 1913.

- Part 1 (out of print).*—General Report for 1912. Garnet as a Geological Barometer. Wolframite in Tavoy District, Lower Burma. Miscellaneous Notes.
- Part 2 (out of print).*—Mineral Production of India during 1912. Relationship of the Himalaya to the Indo-Gangetic Plain and the Indian Peninsula. Hambergite from Kashmir.
- Part 3.*—Contributions to the geology of the Province of Yunnan in Western China: I. Bhamo-Têng-Yüeh Area: II. Petrology of Volcanic Rocks of Têng-Tüeh District. The Kirana Hills. Banswal Aërolite.
- Part 4.*—Gold-bearing Alluvium of Chindwin River and Tributaries. Correlation of Siwaliks with Mammal Horizons of Europe. Contributions to the Geology of the Province of Yunnan in Western China: III. Stratigraphy of Ordovician and Silurian Beds of Western Yunnan, with Provisional Palæontological Determinations. Notes on "Camarocrinus Asiaticus" from Burma.

VOL. XLIV, 1914.

- Part 1 (out of print).*—General Report for 1913. Carbonaceous Aërolite from Rajputana. Nummulites as Zone Fossils, with description of some Burmese species.
- Part 2.*—Contributions to the Geology of the Province of Yunnan in Western China: IV. Country around Yunnan Fu. Dyke of white Trap from Pench Valley Coal-field, Chhindwara District, Central Provinces. Mineral concessions during 1913.
- Part 3.*—Coal-seams near Yaw River, Pakokku District, Upper Burma. The Monazite Sands of Travancore. Lower Cretaceous Fauna from Gieumal Sandstone and Chikkim series. Indarctos salmontanus Pilgrim. Future Beheading of Son and Rer Rivers by Hasdo.
- Part 4.*—Salt Deposits of Cis-Indus Salt Range. Teeth referable to Lower Siwalik Creodont genus Dissopsalis Pilgrim. Glaciers of Dhauli and Lissar Valleys, Kumaon Himalaya, September 1912. Miscellaneous Notes.

VOL. XLV, 1915.

- Part 1.*—New Siwalik Primates. Brachiopoda of Namyau Beds of Burma. Miscellaneous Note.
- Part 2.*—General Report for 1914. Note on Sivaelurus and Paramachaerodus.
- Part 3.*—Mineral Production of India during 1914. Three New Indian Meteorites: Kuttipuram, Shupiyan and Kamsagar. Dentition of Tragulid Genus Dorcabune. Hematite Crystals of Corundiform Habit from Kajlidongri, Central India.
- Part 4.*—Geology of country near Ngahlaingdwin. Geology of Chitral, Gilgit and Pamirs.

VOL. XLVI, 1915.

Quinquennial Review of Mineral Production of India for 1909 to 1913.

VOL. XLVII, 1916.

- Part 1.*—General Report for 1915. Eocene Mammals from Burma. Miscellaneous Notes.
- Part 2.*—The Deccan Trap Flows of Linga, Chhindwara District, Central Provinces. Iron Ore Deposits of Twinngé, Northern Shan States.
- Part 3.*—Obituary: R.C. Burton. The Mineral Production of India during 1915. Flemingostrea, an eastern group of Upper Cretaceous and Eocene Ostreidae, with descriptions of two new species.
- Part 4.*—Contributions to the Geology of the Province of Yunnan in Western China: V. Geology of parts of the Salween and Mekong Valleys. A fossil wood from Burma. The Visuni and Ekh Khara Aërolites.

Vol. XLVIII, 1917.

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Vol. LII, 1921.

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VOL. LV, 1923-24.

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